



**ALASKA POLLUTANT DISCHARGE ELIMINATION SYSTEM
PERMIT FACT SHEET – FINAL**

Permit Number: AK0021547

City of Cordova Wastewater Treatment Plant

**ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Wastewater Discharge Authorization Program
555 Cordova Street
Anchorage, AK 99501**

Public Comment Period Start Date: November 25, 2022

Public Comment Period Expiration Date: December 30, 2022

[Alaska Online Public Notice System](#)

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Proposed issuance of an Alaska Pollutant Discharge Elimination System (APDES) permit to

CITY OF CORDOVA

For wastewater discharges from

City of Cordova Wastewater Treatment Plant
200 Orca Inlet
Cordova, AK, 99574

The Alaska Department of Environmental Conservation (the Department or DEC) proposes to reissue an APDES individual permit (permit) to the City of Cordova. The permit authorizes and sets conditions on the discharge of pollutants from this facility to waters of the United States. In order to ensure protection of water quality and human health, the permit places limits on the types and amounts of pollutants that can be discharged from the facility and outlines best management practices to which the facility must adhere.

This fact sheet explains the nature of potential discharges from the Wastewater Treatment Plant (WWTP) and the development of the permit including:

- information on public comment, public hearing, and appeal procedures
- a listing of proposed effluent limitations and other conditions
- technical material supporting the conditions in the permit
- proposed? monitoring requirements in the permit

Appeals Process

The Department has both an informal review process and a formal administrative appeal process for final APDES permit decisions. An informal review request must be delivered within 20 days after receiving the Department's decision to the Director of the Division of Water at the following address:

Director, Division of Water
Alaska Department of Environmental Conservation
555 Cordova Street
Anchorage AK, 99501

Interested persons can review 18 AAC 15.185 for the procedures and substantive requirements regarding a request for an informal Department review.

See <http://dec.alaska.gov/commish/review-guidance/informal-reviews> for information regarding informal reviews of Department decisions.

An adjudicatory hearing request must be delivered to the Commissioner of the Department within 30 days of the permit decision or a decision issued under the informal review process. An adjudicatory hearing will be conducted by an administrative law judge in the Office of Administrative Hearings within the Department of Administration. A written request for an adjudicatory hearing shall be delivered to the Commissioner at the following address:

Commissioner
Alaska Department of Environmental Conservation
Mail: P.O. Box 11180
Juneau, AK 99811
In Person: 555 Cordova Street
Anchorage, AK 99501

Interested persons can review 18 AAC 15.200 for the procedures and substantive requirements regarding a request for an adjudicatory hearing. See <http://dec.alaska.gov/commish/review-guidance/adjudicatory-hearing-guidance> for information regarding appeals of Department decisions.

Documents are Available

The permit, fact sheet, application, and related documents can be obtained by visiting or contacting DEC between 8:00 a.m. and 4:30 p.m. Monday through Friday at the addresses below. The permit, fact sheet, application, and other information are located on the Department's Wastewater Discharge Authorization Program website: <http://dec.alaska.gov/water/wastewater/>.

Alaska Department of Environmental Conservation Division of Water Wastewater Discharge Authorization Program 555 Cordova Street Anchorage, AK 99501 (907) 269-6285	Alaska Department of Environmental Conservation Division of Water Wastewater Discharge Authorization Program Mail: P.O. Box 111800 In Person: 410 Willoughby Avenue, Suite 303 Juneau, AK 99811-1800 (907) 465-5180
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1.0 INTRODUCTION

1.1 Applicant

This fact sheet provides information on the Alaska Pollutant Discharge Elimination System (APDES) permit for the following entity:

Permittee:	City of Cordova
Facility:	Cordova Wastewater Treatment Plant
APDES Permit Number:	AK0021547
Facility Location:	200 Orca Inlet, Cordova, AK 99574
Mailing Address:	P.O. Box 1210, Cordova, AK 99574
Facility Contact:	Mr. Joel Felix, Superintendent Water and Sewer Division, (907) 424-6338

The map in Section 2.1, Figure 1 shows the location of the treatment plant and the location of the outfall. The process flow diagram in Section 2.2, Figure 2 illustrates the treatment process.

1.2 Authority

Section 301(a) of the Clean Water Act (CWA) and Alaska Administrative Code (AAC) 18 AAC 83.015 provide that the discharge of pollutants to water of the U.S. is unlawful except in accordance with an APDES permit. The individual permit reissuance is being developed per 18 AAC 83. A violation of a condition contained in the Permit constitutes a violation of the CWA and subjects the permittee of the facility with the permitted discharge to the penalties specified in Alaska Statutes (AS) 46.03.760 and AS 46.03.761.

1.3 Permit History

In October 1974, the Environmental Protection Agency (EPA) issued the City of Cordova (City) a National Pollutant Discharge Elimination System (NPDES) permit that contained primary treatment requirements for the disposal of domestic wastewater. This permit expired in November of 1976 and was reissued in May 1977, with a compliance schedule to achieve secondary treatment standards by July 1977. The 1977 permit was reissued by EPA in July 1983. Subsequent permit reissuances occurred in January 1990, January 1996, and December 2001.

In October 2008, the Alaska Department of Environmental Conservation (the Department or DEC) received approval from EPA to administer the NPDES Program in the State of Alaska. DEC issued an Alaska Pollutant Discharge Elimination System (APDES) individual permit to the City for the discharge of secondary treated domestic wastewater to Orca Inlet on May 27, 2011. That permit expired on June 30, 2016 and was administratively extended on April 1, 2016. The permit was reissued on June 9, 2017 with a compliance schedule for achieving fecal coliform (FC) effluent limits consistent with secondary treatment water quality standards. The compliance schedule was satisfied in the previous permit term on October 9, 2018. The previous permit expired on July 31, 2022.

The Administrative Procedures Act and state regulation 18 AAC 83.155(c) allow for a federally issued NPDES permit or a state APDES permit to be administratively continued (i.e., continues in force and effect) provided that the permittee submits a timely and complete application for a new permit prior to expiration of the permit. The City of Cordova submitted a timely and complete application to DEC beginning on May 25, 2022 with follow up submittal materials received through June 14, 2022 and an agreement put in place to complete updated mixing zone modeling and an industrial user survey before August 19, 2022. Accordingly, DEC notified the City of Cordova that the permit was administratively continued beginning on August 1, 2022 per a letter dated July 27, 2022.

2.0 BACKGROUND

2.1 Facility Information

The City of Cordova (City) is located on the southeast side of Prince William Sound in the Gulf of Alaska. The community was built on Orca Inlet at the base of Eyak Mountain. It lies 52 air miles southeast of Valdez and 150 miles southeast of Anchorage. The City owns, operates, and maintains the Cordova Wastewater Treatment Plant, which is a publicly owned treatment works (POTW) in Cordova, Alaska.

The facility collects and treats domestic wastewater from the City of Cordova with an approximate service population of 1,680. The facility does not receive significant contributions from industrial users nor is the collection system combined with a storm water sewer system. Since the previous APDES permit issuance, a major modification to the facility was the installation of an onsite hypochlorite generator to replace the reliance on liquid hypochlorite deliveries.

Wastewater is treated to secondary treatment standards. The treatment process is an aerated activated sludge package plant. Treated wastewater is discharged to Orca Inlet. The outfall for treated wastewater is approximately 800 feet from shore and orientated perpendicularly to the shoreline with a six-port diffuser. The discharge pipe is 14 inches in diameter and discharges at a depth of 15.0 ft below mean lower low water.

Average plant performance for the previous permit term is documented in Table 1 below reflecting monthly average NetDMR reporting submittals.

Table 1: Average Plant Performance

Parameter	Average Value 2017-2022 ^a
Flow	0.235 mgd
5-Day Biochemical Oxygen Demand (BOD ₅) concentration	8.85 mg/L
BOD ₅ Loading/Mass	17.3 lbs/day
BOD ₅ percent removal	96.6%
Total Suspended Solids (TSS) concentration	11.1 mg/L
TSS loading/mass	21.8 lbs/day
TSS percent removal	97.4%
pH daily maximum	7.12 S.U.
pH daily minimum	6.52 S.U.
Temperature (Winter)	7.1°C
Temperature (Summer)	12.7°C
Dissolved Oxygen (DO) daily maximum	9.35 mg/L
Dissolved Oxygen (DO) daily minimum	6.16 mg/L
Fecal coliform (FC) bacteria	120 FC/100mL
Enterococci bacteria	10.7 cfu/100mL
Total Ammonia, as Nitrogen	1.84 mg/L
Footnotes: a: Units: mgd = million gallons per day, mg/L = milligrams per liter, lbs/day = pounds per day, S.U. = standard units, °C = degrees Celsius, FC/100 mL = Fecal Coliform per 100 milliliters, cfu/100 mL = colony forming units per 100 milliliters, µg/L = micrograms per liter.	

Figure 1: City of Cordova Wastewater Treatment Plant Map



2.2 Wastewater Treatment

The City of Cordova owns, operates and maintains the WWTP that was built in 1974. Wastewater at the plant is treated to secondary treatment standards. Treatment at the plant begins with primary screening for large debris removal immediately followed by a grit removal chamber. After primary screening and grit removal wastewater flows into two aeration tanks where biologic digestion occurs. Wastewater then enters a clarifier from which clarified effluent is sent to chlorine contact basin for disinfection and sludge is sent to a digester or returned to aeration basins as return activated sludge. Treated wastewater is monitored prior to discharge for total residual chlorine (TRC) to meet permit requirements and to identify if dechlorination is necessary prior to discharge. The average daily design criteria for the City of Cordova WWTP is provided in Table 2.

Table 2: Average Plant Design Criteria

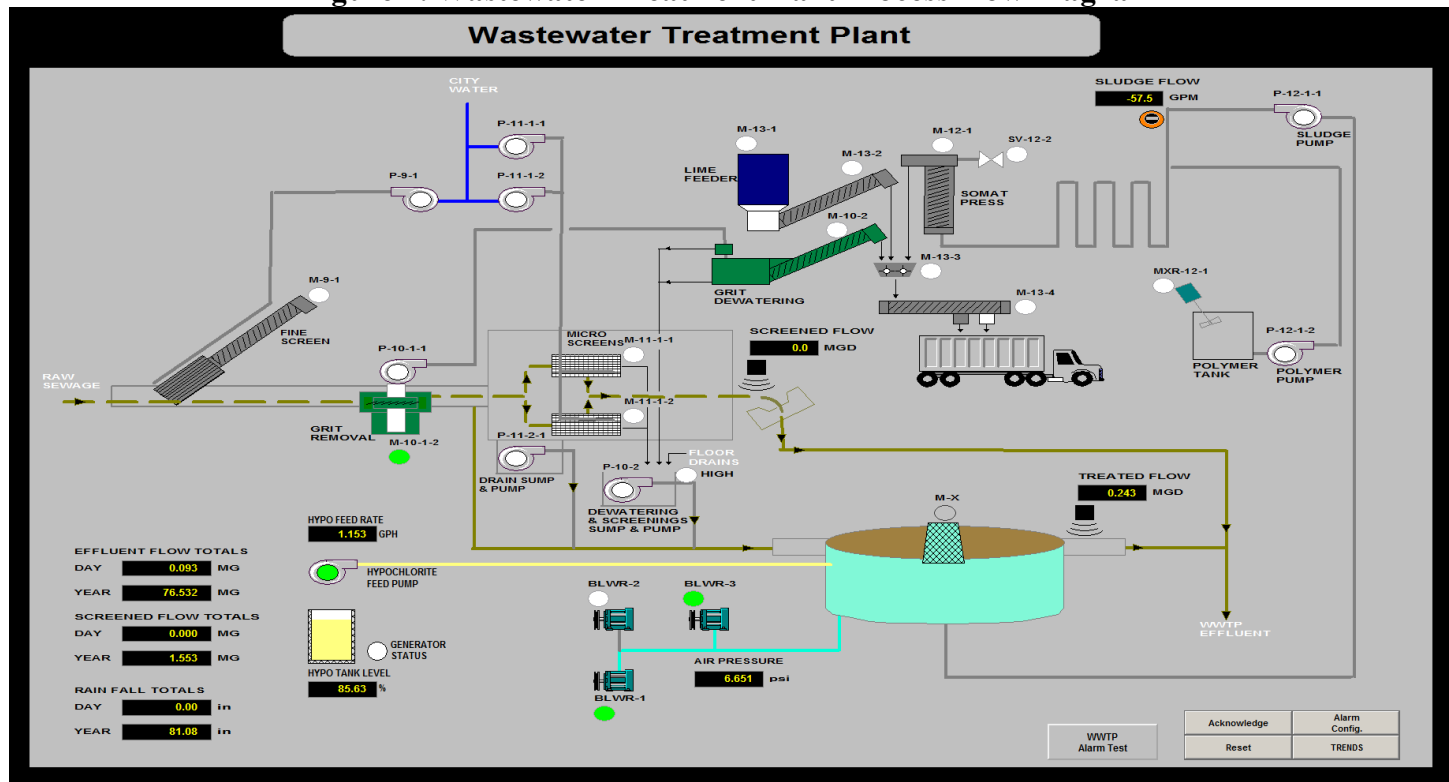
Maximum Daily Flow Rate	0.700 mgd
Total Suspended Solids (TSS) Percent Removal:	85%
BOD ₅ and TSS Percent Removal	85%
Footnotes: Units: mgd = million gallons per day	

Wastewater enters the WWTP from the collection system that services Cordova and contains six lift stations. Outfall 001A discharges treated effluent into Orca Inlet around 4000 feet Southwest of the city center. See Figure 2, for a process flow diagram.

Sludge from the treatment process is dewatered and then disposed at the Cordova Mile 17 Landfill approximately 15 miles southeast of Cordova off of the Copper River Highway. The disposal site operates under a State of Alaska solid waste disposal permit (SW2A005-25).

The facility has installed an onsite hypochlorite generator for disinfection during the previous APDES permit period, no other major modifications of the treatment process occurred.

Figure 2: Wastewater Treatment Plant Process Flow Diagram



2.3 Pollutants of Concern

Pollutants of concern known to be present in the effluent of the WWTP consist of domestic wastewater conventional pollutants regulated in the technology-based effluent limits (TBELs) via the secondary treatment standards, including biochemical oxygen demand (BOD₅), total suspended solids (TSS), and pH. Additional domestic wastewater pollutants known to be in the discharge are ammonia, fecal coliform bacteria, enterococci bacteria, TRC, DO, and temperature.

The previous APDES permit did not identify additional pollutants of concern from expanded effluent testing conducted prior to reissuance and carried forward required additional monitoring from the previous permit for specific parameters. Additional monitoring was required to provide a robust dataset to establish water quality-based effluent limit (WQBELs), if necessary. The parameter monitored in the previous APDES permit cycle was enterococci bacteria. Based on the additional monitoring results, this parameter remains as a pollutant of concern, with monitoring required in the previous APDES permit to continue in this permit cycle.

2.4 Compliance History

DEC reviewed Discharge Monitoring Reports (DMRs) submitted by the City of Cordova from August 2017 to July 2022 to determine the facility's compliance with effluent limits. The DMR review identified three effluent violations, two were for total suspended solids (TSS) exceedances and one for a total ammonia exceedance. These effluent limit exceedances for Outfall 001A are summarized in Table 3.

Table 3: Outfall 001A: Effluent Limit Exceedances

Parameter	Units ^a	Basis	Permit Limit	Number of Exceedances	Maximum Reported Value	Date of Maximum Reported Value
Total Suspended Solids (TSS)	mg/L	Weekly Average	45	1	66.57	11/30/2019
Total Suspended Solids (TSS)	mg/L	Daily Maximum	60	1	76	09/30/2018
Total Ammonia, as N	mg/L	Monthly Average	9.88	1	11	07/31/2019
Footnotes: a. Units: mg/L = milligrams per liter						

During the review of submitted DMRs for the permit reissuance it was identified that fecal coliform daily maximum data was only reported to the 100 cfu / 100 mL level with one significant figure. The minimum value reported during the permit period was 100 cfu / 100 mL and the maximum reported value reported was 800 cfu / 100 mL. After discussion with the permittee, it was determined that the testing method used was Standard Method 9222 D-2006. A criterion of this method is to filter enough sample to result in 20 – 60 FC colonies present per test. Sufficient sample volume was not filtered to attain the method specified number of colonies. As a result, the data from the permit period is only reported to the 100 cfu / 100 mL level. The permittee has agreed to adjust the sample volume filtered and analyzed to attempt to achieve results in the 20 - 60 FC colonies range to provide more detailed and robust FC data for the next permit reissuance.

The DEC Compliance Program conducted facility inspections on 11/15/2017, 2/28/2019 and 6/24/2021. DEC's Compliance and Enforcement Program issued Notice of Violations (NOVs) to the permittee on 1/24/2018, 3/14/2019 and 7/29/2021. Summary of the findings of those inspections are in Table 4.

Table 4: Compliance and Enforcement Actions

Date	Activity	Summary
November 15, 2017	Routine Inspection	Findings of an effluent violation for dissolved oxygen daily minimum during the previous permit period, the facility failed to implement the permit required Operation and Maintenance Plan, maintain required monitoring records of the previous three years, failed to develop and implement permit required facility planning, and failed to report an effluent exceedance verbally to DEC within 24 hours and in writing within five days.
January 24, 2018	Permittee Response Letter	Addressed violations from November 2017 facility inspection.
February 28, 2019	Routine Inspection	Findings of a limit exceedance for total suspended solids (TSS) daily maximum, six bypasses of treatment works due to high flows, failure to report bypasses and a TSS violation in 2018 Annual Report, failure to verbally notify DEC within 24 hours and in writing within five days of an effluent exceedance, and failure to receive approval for receiving water monitoring locations.
March 14, 2019	Permittee Response Letter	Addressed violations from February 2019 facility inspection.
June 24, 2021	Routine Inspection	Findings of an effluent violation for ammonia monthly average, TSS weekly average, and TSS daily maximum. Failed to report enterococci daily maximum and monthly average, failure to submit written notification of noncompliance for effluent exceedances, and 22 bypasses of treatment works during high flow periods.
July 29, 2021	Permittee Response Letter	Addressed violations from June 2021 facility inspection.

An ongoing issue for the City of Cordova WWTP is bypass events resulting from assumed inflow and infiltration (I&I) into the collection system. Table 5 summarizes the bypass events that occurred during the previous permit period. Bypassed flows go through a fine screen and disinfection before being blended with WWTP effluent and discharged to Outfall 001A. During the permit period no bypass events were found to have resulted in exceedances of permit limits. The City of Cordova is in working with the DEC Compliance and Enforcement Program to address noncompliance from its bypass events.

The City of Cordova took the following steps to reduce I&I and the occurrence of bypass events during the previous permit: sealing leaking lift station joints with epoxy, elevating a lift station that was in a tidal zone, and identifying and removing sources of stormwater directed into the collection system. The permit will require the implementation of a facility plan to address the ongoing I&I issue. More information about the facility plan requirement can be found in Fact Sheet Section 7.4.

Table 5: History of WWTP Bypass Events

Date	Total Hours Bypass Occurred	Estimated Volume Bypassed (Million Gallons)
12/6/2017 – 12/11/2017	101	1.900
6/11/2018 – 6/12/2018	20	0.880
6/16/2018 – 6/17/2018	24	0.730
6/18/2018 – 6/19/2018	24	0.980
7/8/2018 – 7/11/2018	55	1.840
8/21/2018 – 8/22/2018	24	0.860
10/15/2018 – 10/17/2018	41	0.820
10/19/2018 – 10/20/2018	22	0.410
5/8/2019 – 5/9/2019	24	0.850
9/18/2019 – 9/19/2019	24	0.420
10/10/2019 – 10/11/2019	22	0.380
10/23/2019 – 10/14/2019	14	0.180
12/14/2019	5	0.150
12/31/2019 – 1/1/2020	27	0.890
2/18/2020 – 2/20/2020	55	1.030
8/5/2020 – 8/6/2020	17	0.060
9/1/2020	4.25	0.040
9/3/2020 – 9/4/2020	17.9	0.200
9/18/2020 – 9/19/2020	26.6	0.250
9/28/2020 – 9/29/2020	17.8	0.080
9/30/2020 – 10/5/2020	121	1.320
10/26/2020	7.9	0.120
11/8/2020 – 11/9/2020	20.2	0.170
12/1/2020 – 12/3/2020	48.1	1.060
12/7/2020 – 12/9/2020	40.1	0.720
12/22/2020 – 12/23/2020	9.3	0.410
1/18/2021 – 1/19/2021	27	0.030
4/14/2021 – 4/15/2021	23.6	0.310
5/28/2021 – 5/30/2021	53.4	0.110
6/1/2021	5	0.050
6/24/2021 – 6/25/2021	28.4	0.600
6/26/2021 – 6/27/2021	26.7	0.060
7/10/2021 – 7/11/2021	24.7	0.400
8/8/2021 – 8/9/2021	13.3	0.130
8/24/2021 – 8/25/2021	14.2	0.060
8/27/2021 – 8/28/2021	28.1	0.940

During the evaluation of total residual chlorine effluent sampling data, it was determined by the City of Cordova that the WWTP had been using an incorrect reagent for the testing method. The use of an incorrect reagent brings question to the validity of the TRC dataset and prevented further evaluation in the reasonable potential analysis (RPA) of the permit. More information about TRC can be found in Fact Sheet Section A.4.2.3. The error has been corrected by the WWTP and referred to DEC Compliance and Enforcement Section.

Despite several noncompliance issues during the previous permit the WWTP routinely produces high quality secondary treatment standard effluent with BOD₅ and TSS removal rates usually greater than 96%. There were no exceedances of FC limits during the permit period.

3.0 EFFLUENT LIMITS AND MONITORING REQUIREMENTS

3.1 Basis for Permit Effluent Limits

Per 18 AAC 83.015, the Department prohibits the discharge of pollutants to waters of the U.S. unless the permittee has first obtained a permit issued by the APDES Program that meet the purposes of AS 46.03 and is in accordance with the CWA Section 402. Per these statutory and regulatory provisions, the Permit includes effluent limits that require the discharger to (1) meet standards reflecting levels of technological capability, (2) comply with 18 AAC 70 – Water Quality Standards, and (3) comply with other state requirements that may be more stringent.

The CWA requires that the limits for a particular pollutant be the more stringent of either technology-based effluent limits (TBELs) or WQBELs. TBELs are set according to the level of treatment that is achievable using available technology. A WQBEL is designed to ensure that the water quality standards of a waterbody are met. WQBELs may be more stringent than TBELs.

The permit contains a combination of both TBELs and WQBELs. The Department first determines if TBELs are required to be incorporated into the permit. TBELs for publicly owned treatment works (POTW), which apply to the publicly owned WWTP, are derived from the secondary treatment standards found in Title 40 Code of Federal Regulations (40 CFR) §133.102 and 40 CFR §133.105, adopted by reference at 18 AAC 83.010(e). The following section summarizes the proposed effluent limits. A more expansive technical and legal basis for the proposed effluent limits is provided in APPENDIX A: Basis for Effluent Limitations.

3.2 Basis for Effluent and Receiving Water Monitoring

In accordance with AS 46.03.110(d), the Department may specify in a permit the terms and conditions under which waste material may be disposed. Monitoring in a permit is required to determine compliance with effluent limits. Monitoring may also be required to gather effluent and receiving water data to determine if additional effluent limits are required and/or to monitor effluent impact on the receiving waterbody quality.

The permit also requires the permittee to perform the additional effluent monitoring required by the APDES application Form 2A for POTWs, so that this data is available when the permittee applies to reissue the APDES permit. The permittee is responsible for conducting the monitoring and submitting the results with the application for renewal of the APDES permit. The permittee should consult and review Form 2A upon permit issuance to ensure that the required monitoring in the application is completed prior to submitting a request for permit renewal. A copy of Form 2A can be found at <http://dec.alaska.gov/water/wastewater/permit-entry/domestic-and-municipal/>

3.3 Effluent Limits and Monitoring Requirements

The permit contains a combination of both TBELs and WQBELs. The permit requires monitoring to determine compliance with effluent limitations and/or for use in future reasonable potential analyses. The permit requires monitoring of secondary treated domestic wastewater effluent that is discharged through Outfall 001A. Flow,

BOD₅, TSS, pH, dissolved oxygen, total residual chlorine, ammonia, FC bacteria, enterococci, and ammonia all have associated limits.

WQBEL's for ammonia and TRC have been revised based on the RPA, but the effluent limits for BOD₅, TSS, pH, and FC bacteria have all been carried forward from the previous permit. Effluent limits are based on the secondary treatment standards adopted in 18 AAC 83.010(e). This includes the permit requirement to monitor the influent for BOD₅ and TSS to calculate removal rates for these parameters. Limits are documented in Table 6 or for a more expansive technical and legal basis for the proposed effluent limits see APPENDIX A: BASIS FOR EFFLUENT LIMITATIONS.

Monitoring frequencies are based on the nature and effect of the pollutant, as well as a determination of the minimum sampling necessary to adequately monitor the facility's performance. The permittee has the option of taking more frequent samples than required under the permit. These additional samples must be used for averaging (for pollutants results reported on a monthly or weekly average) if they are conducted using approved test methods (found in 18 AAC 70 and 40 CFR Part 136, adopted by reference in 18 AAC 83.010).

For all effluent monitoring, the permittee must use a sufficiently sensitive EPA approved test method that quantifies the pollutants to a level lower than applicable limits or water quality standards or use the most sensitive test method available, per 40 CFR §136, adopted by reference in 18 AAC 83.010(f).

When evaluating the effluent to determine if WQBELs based on chemical-specific numeric criteria are needed, the Department projects the receiving waterbody concentration (RWC) for each pollutant of concern downstream of where the effluent enters the receiving waterbody. The chemical-specific concentration of the effluent and receiving waterbody and, if appropriate, the dilution available from the receiving waterbody, are factors used to project the RWC. If the projected concentration of the receiving waterbody exceeds the numeric criterion for a limited parameter, then there is reasonable potential (RP) that the discharge may cause or contribute to an excursion above the applicable Water Quality Standards (WQS), and a WQBEL must be developed. If the projected concentration of the receiving waterbody is lower than the numeric criterion for a limited parameter, then there is not RP that the discharge may cause or contribute to an excursion above the applicable WQS, and it is expected that the effluent will meet WQS at the point of discharge. The effluent limits that would be applied in the latter case are the WQS for the limited parameter.

Ammonia was the driver of the chronic and acute mixing zones during the previous permit cycle and continues to be the driving parameter of the mixing zones in the current permit. Data collected by the permittee from August 2017 to July 2022 was evaluated to determine if there was reasonable potential to cause or contribute to an exceedance of the criteria. The toxicity of ammonia is dependent on pH, temperature, and salinity; therefore, the criteria is pH, temperature, and salinity dependent. An RPA of effluent ammonia data collected during the previous permit cycle reveals that concentrations of ammonia present in the effluent of the City of Cordova WWTP have been reduced from the prior permit period. More information about the ammonia RPA can be found in the Fact Sheet APPENDIX B.

Total residual chlorine was monitored at a daily frequency under the previous permit. It was determined by the City of Cordova that their TRC sampling was not being executed correctly. The WWTP was using an incorrect TRC reagent. Test results were not outside of expected concentrations and the laboratory error was not caught until the permit reissuance. The lab error brings into question the validity of the effluent TRC data set; therefore, it was not considered for RPA analysis and WQBELs for TRC are implemented as limits with the standard DEC recognized compliance level of 0.10 mg/L. Because the compliance level is greater than acute and chronic water quality criteria for marine water, TRC is included in the mixing zone sized for ammonia. TRC will be further evaluated during the next permit reissuance when new data is available. More information about TRC can be found in the Fact Sheet Section A.4.2.3.

An unchanged WQBEL for FC is included in the permit. In the previous permit, FC was included in the mixing zone and the WQBELs were 200 FC/100 mL for the Monthly Average, 400 FC/100 mL for the Weekly Average and 800 FC/100 mL for the Daily Maximum. During the previous permitting cycle, a total of 312 FC samples were collected. The average reported maximum daily concentration over three years was 300 FC/100

mL. Therefore, FC is included as a parameter in the authorized mixing zone. The Daily Maximum limit for FC is 800 FC/100 mL, the Weekly Average limit is 400 FC/100 mL and the Monthly Average limit is 200 FC/100 mL. The previous permit required FC to be monitored once per week and this monitoring frequency requirement for FC is carried forward. More information about FC can be found in Fact Sheet Section A.4.2.6.

This permit requires continued monitoring of enterococci bacteria. Enterococci bacteria are indicator organisms of harmful pathogens recommended by the EPA to protect primary contact recreation for marine waters. The Alaska WQS at 18 AAC 70.020(b)(14)(B) for contact recreation specifies that the enterococci bacteria concentration shall not exceed 35 enterococci cfu/100mL, and not more than an 10% of the samples may exceed a concentration of 130 enterococci cfu/100mL. Contact recreation is defined as activities in which there is direct and intimate contact with water. These activities typically only take place during the summer season, May to September.

DEC reviewed enterococci bacteria monitoring data from August 2017 to July 2022. The daily maximum results ranged from 1.0 cfu/100ml to 31.8 cfu/100ml. Results did not exceed water quality criteria and DEC determined enterococci bacteria would not be reasonably expected to exceed water quality criteria at the end of pipe. However, the limited data set for enterococci bacteria may not be representative of reasonable potential. The report only permit requirement is carried forward with enterococci bacteria being included in the authorized mixing zones to attain a more robust data set to evaluate for the next permit reissuance. The monitoring frequency, as in the prior permit, is monthly sampling from May-September, months in which Orca Inlet is most likely to be used for primary contact recreation. Enterococci bacteria monitoring is required to be performed at the same time as FC bacteria monitoring and shall be collected on the same day.

Effluent temperature continues to be a reporting only monitoring requirement. Alaska WQS at 18 AAC 70.020(b)(22) states that temperature for marine water for seafood processing, growth and propagation of fish, shellfish, other aquatic life, wildlife, and harvesting for consumption of raw mollusks or other raw aquatic life may not exceed 15 degrees Celsius ($^{\circ}$ C). DEC reviewed temperature monitoring data for from August 2017 to June 2022. During this period the temperature ranged from a minimum of 3.2 $^{\circ}$ C to a maximum of 18.9 $^{\circ}$ C with 1640 data points. It is reasonable to assume that the discharge will periodically continue to exceed water quality criteria. However, temperature effluent limits are not included, as DEC determined temperature would meet water quality criteria at approximately 1.12 meters from Outfall 001 A and fits within the authorized mixing zone. Monitoring effluent temperature will continue with a daily monitoring frequency, the daily maximum value is reported each month in addition to the monthly average value to aid evaluation in future RPAs. More information can be found in Fact Sheet Section A.4.2.4.

Table 6 contains Outfall 001 A effluent limits and monitoring requirements.

Table 6: Outfall 001A: Effluent Limits and Monitoring Requirements

Parameter	Effluent Limits					Monitoring Requirements		
	Units ^a	Daily Minimum	Monthly Average	Weekly Average	Daily Maximum	Sample Location	Sample Frequency	Sample Type
Total Discharge Flow	mgd	N/A	0.7	N/A	Report	Effluent	Continuous	Recorded
Biochemical Oxygen Demand (BOD ₅)	mg/L	N/A	30	45	60	Influent and Effluent ^c	1/Week	24-hour Composite ^d
	lbs/day ^b		175	263	350			Calculated
Total Suspended Solids (TSS)	mg/L	N/A	30	45	60	Influent and Effluent ^c	1/Week	24-hour Composite ^d
	lbs/day		175	263	350			Calculated
BOD ₅ & TSS Minimum Percent (%) Removal	%	N/A	85 ^e	N/A	N/A	Influent and Effluent	1/Month	Calculated
pH	SU	6.5	N/A	N/A	8.5	Effluent	Daily	Grab
Temperature	° C	N/A	N/A	N/A	Report	Effluent	Daily	Grab
Dissolved Oxygen (DO)	mg/L	6.0	N/A	N/A	17	Effluent	Daily	Grab
Total Residual Chlorine (TRC) ^f	mg/L	N/A	0.0075	N/A	0.013	Effluent	Daily	Grab
Fecal coliform Bacteria (FC)	FC/100 mL	N/A	200 ^g	400 ^g	800	Effluent	1/Week	Grab
Enterococci	cfu/100 mL	N/A	Report ^g	N/A	Report	Effluent	1/Month ^h	Grab
Total Ammonia, as N	mg/L	N/A	5.7	8.6	17	Effluent	1/Month	24-hour Composite ^d
	lbs/day	N/A	33	50	99			

Footnotes:

- Units: mgd = million gallons per day, mg/L = milligrams per liter, lbs/day = pounds per day, SU = standard units, °C = degrees Celsius, FC/100 mL = Fecal Coliform per 100 milliliters, cfu/100 mL = colony forming units per 100 milliliters, µg/L = micrograms per liter.
- lbs/day = concentration (mg/L) x flow (mgd) x 8.34 (conversion factor).
- Limits apply to effluent. Report average monthly influent concentration. Influent and effluent composite samples shall be collected during the same 24-hour period.
- See Appendix C for definition.
- Minimum % Removal = [(monthly average influent concentration in mg/L – monthly average effluent concentration in mg/L) / (monthly average influent concentration in mg/L)] x 100. The monthly average percent removal must be calculated using the arithmetic mean of the influent value and the arithmetic mean of the effluent value for that month.
- The TRC effluent limits are not quantifiable using EPA-approved analytical methods. DEC will use the minimum level (ML) of 0.1 mg/L as the compliance evaluation level for this parameter.
- If more than one bacteria sample for FC or enterococci is collected within the reporting period, the average result must be reported as the geometric mean. When calculating the geometric mean, replace all results of zero, 0, with a one, 1. The geometric mean of “n” quantities is the “nth” root of the product of the quantities. For example, the geometric mean of 100, 200, and 300 is $(100 \times 200 \times 300)^{1/3} = 181.7$.
- One sample shall be collected each month, May through September, on the same day as a fecal coliform bacteria sample is collected.

3.4 Receiving Waterbody Limits and Monitoring

Orca Inlet is protected for the following uses per 18 AAC 70.020(a)(2)(A) – (D): water supply for aquaculture, seafood processing, and industrial uses; water recreation, including both contact recreation and secondary recreation; growth and propagation of fish, shellfish, other aquatic life, and wildlife; and harvesting for consumption of raw mollusks or other raw aquatic live. The City of Cordova during the last permit period was required to monitor Orca Inlet outside the influence of the regulatory mixing zone at the approved receiving water monitoring location approximately 1500 ft North of Spike Island to assess temperature, salinity, and pH concentrations.

Monitoring data from August 2017 to July 2022 was used in the development of the permit. Due to the robust data set submitted and because DEC does not anticipate any significant variances in the ambient water monitoring station, the receiving water monitoring requirements will not be carried forward in this next permit cycle.

Receiving water data was also required to be collected biannually at each edge of the regulatory mixing zone for fecal coliform bacteria, ammonia, enterococci bacteria, total residual chlorine, and pH. The biannual data did not indicate exceedances for these parameters at the mixing zone boundary. The City of Cordova failed to sample for TRC at the edge of the mixing zone during the permit period. However, with effluent sampling required at a daily frequency for TRC in the permit, DEC determined the sampling is sufficient to model receiving water conditions in the next permit reissuance and be protective of the environment. With regular effluent monitoring requirements for pollutants of concern in the permit and the ability to perform Cornell Mixing Zone Expert System (CORMIX) mixing zone modeling, DEC does not find future infrequent sampling from the edge of the mixing zone to be additionally protective of the environment or necessary. Therefore, edge of mixing zone monitoring requirements will not be carried forward in the permit.

4.0 RECEIVING WATERBODY

4.1 Description of Receiving Waterbody

According to Thorne et al, 2008, “Orca Inlet runs along the south side of Hawkins Inlet in the southeast corner of Prince William Sound. Water flows into the inlet from the Gulf of Alaska, via Strawberry Channel, northeast to Nelson Bay, where it mixes with Prince William Sound water that has coursed along the north side of Hawkins Island. Extensive mud flats fill the lower portion of the inlet, through which two channels course and join near Mud Bay on the west side of the inlet opposite Cordova. The area near the City of Cordova WWTP Outfall 001A is “generally quite shallow (≤ 15 meters)” while the “physical oceanography...is characterized by low freshwater input and strong vertical mixing from tidal currents...brackish with very weak stratification.”

4.2 Outfall Description

The WWTP continually discharges treated effluent into Orca Inlet. The outfall terminus is positioned approximately 15 ft below mean lower low water. Outfall 001A terminus is a single discharge unit with a six-port diffuser. Geographic coordinates of the outfall are 60.537723° North latitude and 145.780469° West longitude.

4.3 Water Quality Standards

Section 301(b)(1)(C) of the CWA required the development of limits in permits necessary to meet water quality standards by July 1, 1977. Per 18 AAC 83.435, APDES permits must include conditions to ensure compliance with WQS. Additionally, regulations in 18 AAC 70 require that the conditions in permits ensure compliance with the WQS. The State’s WQS are composed of waterbody use classifications, numeric and/or narrative water quality criteria, and an Antidegradation Policy. The use classification system identifies the designated uses that each waterbody is expected to achieve. The numeric and/or narrative water quality criteria are the criteria deemed necessary by the state to support the designated use classification of each waterbody. The

antidegradation policy ensures that the existing uses and the level of water quality necessary to protect the uses are maintained and protected.

Water bodies in Alaska are designated for all uses unless the water has been reclassified under 18 AAC 70.230 as listed under 18 AAC 70.230(e). Some waterbodies in Alaska can also have site-specific water quality criterion per 18 AAC 70.235, such as those listed under 18 AAC 70.236(b). The receiving water for this discharge, Orca Inlet, has not been reclassified, nor have site-specific water quality criteria been established. Therefore, existing uses and designated uses are the same and Orca Inlet must be protected for all marine use classes listed in 18 AAC 70.020(a)(1). The marine water designated uses consist of the following: (A) water supply (aquaculture, seafood processing, and industrial), (B) water recreation (contact and secondary), (C) growth and propagation of fish, shellfish, other aquatic life, and wildlife, and (D) harvesting for consumption of raw mollusks or other raw aquatic life.

4.4 Water Quality Status of Receiving Water

Any part of a waterbody for which the water quality does not, or is not expected to meet applicable WQS is defined as a “water quality limited segment” and placed on the State’s impaired waterbody list. For an impaired waterbody, Section 303(d) of the CWA requires states to develop a TMDL management plan. The TMDL documents the amount of a pollutant a waterbody can assimilate without violating a state’s WQS and allocates that load to known point sources and nonpoint sources. Orca Inlet is not included as an impaired water body in the Alaska Department of Environmental Conservation 2022 Final Integrated Water Report. The report is no longer published, findings are accessed through the EPA How’s My Waterbody website at:

<https://mywaterway.epa.gov/state/AK/water-quality-overview>. No TMDL has been prepared for Orca Inlet.

4.5 Mixing Zone Analysis

In accordance with state regulations at 18 AAC 70.240, the Department may authorize a mixing zone in a permit. Determination of the mixing zone requires an evaluation of critical conditions of the flow regimes of the receiving waterbody, effluent characterization and concentration projections, and discharges rates. These critical conditions are addressed in the permit application. A chronic mixing zone is sized to protect the ecology of the waterbody as a whole and an acute mixing zone is sized to prevent lethality to passing organisms.

In the previous permit, a compliance schedule for fecal coliform was completed prior to the October 2018 compliance reporting period. After completion of the compliance schedule a new chronic mixing zone authorized for ammonia, TRC, FC bacteria, and enterococci bacteria went into effect centered on Outfall 001A in the shape of a rectangle with a length of 222 meters (parallel to the shoreline) and 12 meters in width. Additionally, an acute mixing zone centered on Outfall 001A sized at a width of 12 meters and a length of 26 meters, from the seafloor to the surface, was established per 18 AAC 70.255 for ammonia and TRC.

DEC received the City of Cordova’s application for reissuance of the permit on May 25, 2022. On August 16, 2022, DEC received a revised Form 2M and a data summary of the effluent data from the monitoring required by the previous permit. The City of Cordova contracted GV Jones & Associates and SLR International Corporation (SLR) to complete the report. SLR used the CORMIX 12.0 modeling program, a widely used and broadly accepted modeling tool. To simulate reasonable worst-case conditions the facility’s average daily design flow rate of 0.7 mgd was used for modeling. Modeling was calculated MECs for ammonia. SLR on behalf of the City of Cordova compiled an effluent data summary and subsequently performed an RPA following the DEC’s recommended RPA procedures (DEC 2009 and Tetra Tech 2013). In the analysis, SLR determined ammonia was the driving parameter for the mixing zone dimensions. The City of Cordova requested re-sized mixing zone for ammonia with ammonia as the parameter requiring the most dilution. SLR proposed modifications for dilution, and reduced sizes of the mixing zone.

SLR modeled the acute and chronic mixing zones and calculated dilution using CORMIX 12.0 modeling software. Inputs included the maximum expected effluent concentrations and the acute and chronic WQ criteria of parameters that demonstrated reasonable potential (see Appendix B for details on the RPA), as well as any site-specific discharge and ambient data. SLR determined ammonia was the parameter that required the most

dilution and the determined the acute and chronic mixing zone sizes necessary to achieve WQS at the boundary of the mixing zone. All other parameters needing a chronic or acute mixing zone to meet their respective water quality criterion fit within the mixing zones sized for ammonia.

For the critical receiving water concentrations for ammonia SLR carried forward the value used in the previous permit which was 15 percent of water quality criteria. SLR referenced an outlier ammonia receiving water data point (1.5 mg/L) from 02/12/2019 and a small data set (nine data points) in the submitted report as a reason for not using receiving water monitoring data from the past permit for ammonia receiving water concentration. SLR used the 15th percentile for salinity of receiving water and the 85th percentile for temperature, pH, and salinity in the mixing zone analysis. SLR also rounded receiving water results for temperature and salinity to whole numbers.

DEC found that the outlier data point from a receiving water sample taken 02/12/2019 for ammonia was misinterpretation of the lab report and the actual result for ammonia on that date was no detection (ND). DEC under its normal practice used the 85th percentile of receiving water sampling data for determining critical receiving water concentration for ammonia. To calculate the acute and chronic water quality criteria for ammonia, DEC used the 85th percentile of the receiving water concentrations for temperature and pH sampled between the May and October for determining critical conditions for ammonia as recommended in the June 2014 APDES Permits RPA and Effluent Limits Development Guide. DEC supplemented the data set for receiving water temperature and pH by including edge-of-mixing zone sampling data between May and October taken under the previous permit. This increased the number of data points for the analysis from four to twenty for temperature and pH. DEC also used the 85th percentile of receiving water salinity sampling data taken under the previous permit. Ambient water quality data is summarized in Table 7.

Table 7: Orca Inlet Receiving Water Monitoring Results, 2017 to 2022

Parameter	Units ^a	Minimum Value	Maximum Value	Concentration Proposed by SLR in RPA Analysis	Concentration Used in Final RPA Analysis
Ammonia, as Nitrogen	mg/L	ND ^b	0.2	0.075	0.165
pH	S.U.	6.8	8.87	8.6	8.516
Temperature ^c	°C	5.3	12.4	10	10.24
Salinity	g/kg	30	34.2	30	33.73
Footnotes: a) Units: µg/L=micrograms per liter, mg/L=milligrams per liter, S.U.=standard units, °C=degrees Celsius. b) ND = non-detect. c) Temperature sampling data between May and October to represent critical receiving water conditions.					

In accordance with 18 AAC 70.240, DEC modeled the acute and chronic mixing zones and calculated dilution using the CORMIX version 12.0 modeling program. DEC modeled a single port of the six-port diffuser with a corresponding one sixth ratio of the critical flow. Individual port plumes did not overlap before the criterion maximum concentration and criterion continuous concentration for acute and chronic dilution was met. Therefore, single port modeling was appropriate with the length of the diffuser added to a plume width at which acute and chronic water quality criteria was met from a single diffuser to encompass the entire mixing zone width. Length of the mixing zone was determined by doubling the length of the discharge plume distance to meeting acute and chronic water quality criteria which accounts for tidal reversals in Orca Inlet.

DEC concurs with SLR that ammonia drives the chronic and acute mixing zones. However, DEC's models yielded different mixing zone sizes than was proposed by SLR. DEC's analysis was based on inputs to CORMIX that included the MECs and the acute and chronic WQS numeric criteria of parameters, such as ammonia, total residual chlorine, temperature, fecal coliform bacteria, and enterococci bacteria, that demonstrated reasonable potential to exceed water quality criteria at the end of pipe, as well as site-specific discharge and ambient data. Effluent performance data from the WWTP and the daily design flow of 0.7 mgd were also used in the analysis. See Fact Sheet APPENDIX A for details on the basis of effluent limitations.

DEC had concerns about the method of reporting for TRC effluent monitoring in DMRs by the WWTP. Daily maximum values were reported as detections from 0.05 mg/L to 0.10 mg/L, values which are less than the compliance evaluation level of 0.10 mg/l under the previous permit. After communicating these concerns, it was determined by the City of Cordova that the WWTP had not been using the correct reagent in lab testing for TRC monitoring of the effluent. It was therefore determined by DEC that the TRC data from the previous permit period was not valid and could not be used in a TRC RPA analysis.

Differences between the City of Cordova's submitted CORMIX model and DEC's CORMIX model for the chronic and acute mixing zones driven by ammonia were primarily due to the use of rounding by SLR in determining critical receiving water concentrations. This caused the calculated receiving water quality standards for ammonia to be inappropriate. With SLR's inputs, acute WQS for ammonia was calculated to be 4.9 mg/L and chronic WQS was calculated to be 0.7 mg/L. SLR then compared the results to the calculated ammonia WQS from the previous permit of 3.3 mg/L acute and 0.5 mg/L chronic and used the more restrictive limits from the previous permit when modeling the mixing zones to be more protective of Orca Inlet. DEC rejects using past calculated ammonia WQS when new receiving water data is available. The Department's results, used in the final mixing zone determination, were calculated to be 3.91 mg/L for the acute ammonia WQS and 0.59 mg/L for the chronic ammonia WQS. This resulted in a comparable mixing zone to what was proposed by SLR. The slight differences in mixing zone sizes proposed by DEC and SLR can be explained by the differences in the receiving water data set used to calculate ammonia WQS and the ambient receiving water ammonia concentrations used in the models.

DEC's analysis confirmed ammonia required the most dilution for chronic and acute mixing of the parameters that demonstrated RP to exceed chronic water quality criteria, and therefore determined the final chronic and acute mixing zone sizes. TRC, FC bacteria, enterococci bacteria, and temperature fit within the chronic mixing zone sized for ammonia. Dilution levels for ammonia were identified from modeling the Maximum Expected Concentration (MEC) in CORMIX. The chronic ammonia mixing zone required a dilution factor of 38.8. The chronic mixing zone has a length, parallel to the shoreline, of 25.2 meters and a width of 12.81 meters. The water quality criteria may be exceeded within the authorized chronic mixing zones. All water quality criteria will be met and apply at the boundary of the chronic mixing zone.

The smaller, initial, acute mixing zone for ammonia surrounding the outfall is contained within the larger chronic mixing zone. TRC, FC bacteria, and enterococci bacteria are contained within the boundary of the acute mixing zone. The acute mixing zone required a dilution factor of 4.4, with a length of 3.8 meters and a width of 12.35 meters. Acute aquatic life criteria will be met and apply at and beyond the boundary of this smaller initial mixing zone surrounding the outfall.

Table 8 compares the dilution and mixing zone sizes used in the previous permit to the dilution and mixing zone sizes for the current permit. Figure 3 displays a map of the mixing zones for the current permit.

Table 8: Mixing Zone Dilution Factors (DF) and Sizes for Current Permit

Mixing Zone	Previous Permit [2017-2022]		Current Permit [2022-2027]	
	DF	Dimensions (m)	DF	Dimensions Length X Width (m)
Acute	8.5	26 X 12.2	4.4	3.8 X 12.35
Chronic	65	222 X 12	38.8	25.2 X 12.81

According to EPA (1991) and 18 AAC 70.240, lethality to passing organisms would not be expected if an organism passing through the plume along the path of maximum exposure is not exposed to concentrations exceeding the acute criteria when averaged over a one-hour time period. Furthermore, the travel time of an organism drifting through the acute mixing zone must be less than approximately 15 minutes if a one-hour exposure is not to exceed the acute criterion. DEC determined that the travel time of an organism drifting through the acute mixing zone to be approximately 2 seconds; therefore, there will be no lethality to organisms passing through the acute mixing zone.

Other data required for the mixing zone modeling included: the input of receiving water characteristics at the outfall, such as the depth of the receiving water at the outfall, the ambient velocity, wind velocity, bank configuration and distance of the outfall from the bank. Based on the inputs, CORMIX predicted the distance at which the parameters would meet Alaska WQS as well as the corresponding dilution at the point. Table 9 provides a list of inputs used in the CORMIX modeling program.

Fact Sheet APPENDIX D outlines criteria that must be met in order for the Department to authorize a mixing zone. These criteria include the size of the mixing zone, treatment technology, existing uses of the waterbody, human consumption, spawning areas, human health, aquatic life, and endangered species. The following summarizes the Department's mixing zone analysis.

4.5.1 Size

In accordance with 18 AAC 70.240(k), the mixing zone must be as small as practicable. In order to ensure that the mixing zone is as small as practicable, DEC used CORMIX 12.0 to model the chronic and acute mixing zones for seasonal flow rates, effluent temperatures, effluent flow rates and ambient density profiles. 18 AAC 70.240(b)(2) requires the Department to consider the characteristics of the effluent after treatment of the wastewater. DEC reviewed the most recent four and a half years of DMRs from August 2017 through July 2022 and the City of Cordova's wastewater discharge application, Form 2A, to determine which parameters had

reasonable potential to exceed water quality criteria at the end of pipe, and then which of the parameters required the most dilution to meet water quality criteria for the chronic and acute mixing zones. Ammonia, fecal coliform bacteria, enterococci bacteria, temperature, and TRC are the only pollutants that require dilution in the chronic mixing zone and therefore is the driving parameter. Ammonia required the most dilution in the chronic mixing zone to meet aquatic life water quality criteria for marine water. Therefore, ammonia was modeled in CORMIX to determine the smallest practicable chronic mixing zone size.

The maximum expected concentrations for ammonia, corresponding site-specific ammonia aquatic life water quality criteria for marine water, and assumed ambient ammonia concentrations were entered into CORMIX. For the ambient concentration of ammonia, the Department followed its RPA and Effluent Limit Development Guide and used the 85th percentile of ambient ammonia monitoring data that was collected during the previous permit.

In accordance with 18 AAC 70.240, the Department determined that the size of the mixing zone for the City of Cordova WWTP discharge is appropriate. The previous permit authorized a chronic mixing zone that was 222 meters by 12 meters with a dilution factor of 65. DEC proposes to authorize one chronic mixing zone driven by ammonia that is 25.2 meters long by 12.81 meters wide and provides a dilution factor of 38.8. The previous permit authorized an acute mixing zone that was 26 meters by 12.2 meters with a dilution factor of 8.5. DEC proposes to authorize one acute mixing zone driven by ammonia that is 3.8 meters long by 12.35 meters wide and provides a dilution factor of 4.4. See Table 9: Summary of DEC CORMIX Model Inputs for more detail on CORMIX inputs used to model acute and chronic mixing zones.

The relationship between dilution and factors and mixing zone sizes is predicted by CORMIX modeling. Per 18 AAC 83.135 (b)(2), the Department has cause to modify a permit when the Department receives new information that was not available at the time of permit issuance, and the new information would have justified the imposition of different permit conditions at the time of issuance.

The acute mixing zone, driven by ammonia, is sized according to the dilution required by ammonia to meet acute aquatic life water quality criteria. The acute mixing zone is based on five years of ammonia effluent data submitted by the permittee and results from August 2017 to July 2022. The CORMIX model indicates that the water quality criteria would be met relatively rapidly, approximately parallel to the direction of the ambient tidally influenced current. The mixing zone is sized to ensure: 1) the water quality criteria found in 18 AAC 70 are met at the boundary of the mixing zones, 2) the mixing zone is as small as practicable, and 3) compliance with all other applicable mixing zone regulations.

Table 9: Summary of DEC CORMIX Model Inputs

Table 3: Summary of DEC CORMIX Model Inputs				
Parameter Modeled	Maximum Expected Concentration	Ambient Concentration	Chronic Water Quality Criterion	Acute Water Quality Criterion
Ammonia	16.64 mg/L	0.165 mg/L	0.59 mg/L	3.91 mg/L
Outfall Characteristics				
Outfall Type & Length	Single 14-inch pipe extending approximately 800 feet from shore, six-port diffuser that is 12.19 meters in length with evenly spaced ports orientated perpendicularly to prevalent tidal currents.			
Port Height above Streambed	0.3 m			
Port Characteristics ^{a, b}	Diameter=0.0787 m, Vertical angle Theta=0 °, Horizontal angle Sigma=0 °, Port Height above Channel Bottom=0.3 m			
Effluent Characteristics				
Flow Rate	0.7 mgd design flow			
Flow Rate per Individual Port	0.1167 mgd			
Temperature	9.4 °C ^a			
Ambient Receiving Water Conditions				
Discharge Depth	4.9 m			
Wind Speed	1.9 m/s			
Receiving water current velocity	0.1 meters per second (m/s) ^b			
	0.9 m/s ^c			
Manning's n	0.025			
Density (Uniform)	1025 kg/m ³			
Footnotes:				
a.	Average of January 2018 to June 2022 effluent temperature data.			
b.	Low current condition			
c.	High current condition			

Figure 3: City of Cordova Wastewater Treatment Plant Permit Chronic and Acute Mixing Zones



4.5.2 Technology

In accordance with 18 AAC 70.240(c)(1), the Department finds that available evidence reasonably demonstrates that the wastewater at the City of Cordova WWTP will be treated to remove, reduce, and disperse pollutants using methods found by the Department to be the most effective and technological and economical feasible, consistent with the highest statutory and regulatory treatment requirements.

The WWTP treatment system includes preliminary treatment, primary treatment; secondary treatment via extended aeration activated sludge, secondary clarifiers, chlorine disinfection, and dechlorination. The facility rarely violates permit limits and routinely produces high quality effluent. Wastewater effluent at the City of Cordova WWTP often exceeds minimum percent removal secondary treatment requirements. The facility averaged 97.4% removal of TSS and over 96.6% removal of BOD₅ under the previous permit.

4.5.3 Existing Use

In accordance with 18 AAC 70.240(c)(2) and (3) and 18 AAC 70.240(c)(4)(B) and (C), the mixing zone has been appropriately sized to fully protect the existing uses of Orca Inlet. Water quality criteria are developed to specifically protect the uses of the waterbody as a whole. Therefore, if the water quality criteria are met in the waterbody, then the existing uses are protected. Given that water quality criteria will be met at, and beyond, the boundary of the chronic mixing zone, the designated and existing uses beyond the boundary of the chronic mixing zone will be maintained and fully protected under the terms of the permit as required in 18 AAC 70.240(c).

The permit reissuance application does not propose any changes that would result in a lower quality effluent. Effluent monitoring and receiving water monitoring have indicated that the discharge neither partially nor completely eliminates an existing use of the waterbody outside of the mixing zone. DEC has determined that size of the mixing zones will decrease from the previous permit issuance.

4.5.4 Human Consumption

In accordance with the conditions of the permit, and in accordance with 18 AAC 70.240(d)(6) the pollutants discharged cannot produce objectionable color, taste, or odor in aquatic resources harvested for human consumption.

There is no indication that the pollutants discharged have produced objectionable color, taste, or odor in aquatic resources harvested for human consumption. Additionally, the discharge has not precluded or limited established processing activities or commercial, sport, personal use, or subsistence fish and shellfish harvesting. Signs are required to be posted to inform the public that certain activities such as harvesting of aquatic life for raw consumption and primary contact recreation should not take place in the mixing zone.

DEC has determined that application data and available mixing zone modeling suggests that pollutants discharged will neither produce objectionable color, taste, or odor in harvested aquatic resources for human consumption, per 18 AAC 70.240(d)(6)

4.5.5 Spawning Areas

In accordance with 18 AAC 70.240(f), in lakes, streams, rivers, or other flowing fresh waters, a mixing zone will not be authorized in a spawning area for Arctic grayling, northern pike, lake trout, brook trout, sheefish, burbot, landlocked coho salmon, chinook salmon, sockeye salmon, or anadromous or resident rainbow trout, Arctic char, Dolly Varden, whitefish, or cutthroat trout.

The mixing zones are authorized in the marine waters of Orca Bay. 18 AAC 70.240(f), which prohibits authorizing mixing zones in streams, rivers or other flowing fresh waters used for anadromous or resident fish spawning, does not apply. Discharges to fresh waters are not authorized under the permit.

The City of Cordova WWTP mixing zone is not authorized in known spawning areas for anadromous and resident fish. The Alaska Department of Fish and Game's (ADF&G) Catalog of Waters Important for

Spawning, Rearing, or Migration of Anadromous Fishes available at https://www.adfg.alaska.gov/static-sf/AWC/PDFs/2022scn_CATALOG.pdf does not identify Orca Inlet as a spawning area for these freshwater spawning species. More information about essential fish habitat determination can be found in Section 8.3 of the Fact Sheet.

4.5.6 Human Health

In accordance with 18 AAC 70.240(d)(1), the mixing zone will not result in pollutants discharged at levels that will bioaccumulate, bioconcentrate, or persist above natural levels in sediments, water, or biota to significantly adverse levels, based on consideration of bioaccumulation and bioconcentration factors, toxicity, and exposure. 18 AAC 70.240(d)(2) states that the mixing zone may not present an unacceptable risk to human health from carcinogenic, mutagenic, teratogenic, or other effects as determined using risk assessment methods approved by DEC and consistent with 18 AAC 70.025. An analysis of the effluent data that was included with the City of Cordova's application for permit reissuance and the results of the RPA conducted on pollutants of concern indicated that the level of treatment is protective of human health. The effluent data was then used in conjunction with applicable water quality criteria, which serve the purpose of protecting human and aquatic life, to size the mixing zone to ensure all water quality criteria are met in the waterbody at the boundary of the mixing zone.

4.5.7 Aquatic Life and Wildlife

In accordance with 18 AAC 70.240, pollutants for which the mixing zone will be authorized will not result in concentrations that result in undesirable or nuisance to aquatic life, cause permanent or irreparable displacement of indigenous organisms, or a reduction in fish or shellfish population levels. Nor will the discharge form a barrier to migration or prevent zone of passage in the receiving water.

There are no known spawning areas for in the vicinity of the discharge in Orca Inlet. Anadromous fish pass through the discharge area on their way to area rivers and streams to spawn and that smolt migrate through the area on their return to sea. Reasonable potential analysis results and CORMIX modeling conducted for this discharge suggest that pollutants will not be discharged at high levels, will require relatively small dilution factors, that high dilution occurs relatively rapidly, and that pollutants will have a relatively short residence time in the mixing zones (See Fact Sheet 4.5.1). CORMIX modeling incorporated the most stringent water quality criteria for the protection of the growth and propagation of fish shellfish, other aquatic life, and wildlife, and all water quality criteria will be met at the boundary of the authorized mixing zone.

4.5.8 Endangered Species

In accordance with 18 AAC 70.240(c)(4)(F), the mixing zone will not cause an adverse effect on threatened or endangered species. Based on the review of applicable endangered species mapping and data bases and information received from the National Marine Fisheries Service (NMFS) and United States Fish & Wildlife Service (USFWS) in communications with DEC on August 24, 2022 (see Fact Sheet Sections 8.1 and 8.2), combined with consideration of the mixing zone size and critical conditions; DEC determined that the City of Cordova WWTP outfall may contain the threatened Northern Sea Otter and the endangered Short-tailed Albatross.

DEC also consulted the NMFS endangered species mapper at <https://www.fisheries.noaa.gov/resource/map/essential-fish-habitat-mapper> which showed that the area near the WWTP outfall may contain the endangered Steller Sea Lion, and the Mexico Distinct Population Segment of humpback whales.

No detrimental effects to fauna in the area have been documented with previously authorized mixing zones for the facility, nor does the mixing zone appear to pose an undesirable nuisance to aquatic life. The RPA and CORMIX modeling resulted in an overall decrease in the size of the mixing zones, further reducing the possibility for any threatened or endangered species potentially in the area to come into contact with the treated wastewater.

Due to the reduced size and short residence time of pollutants in the mixing zone, DEC has concluded that the mixing zones are sized to not cause an adverse effect on threatened or endangered species in the vicinity of the discharge. DEC will provide a copy of the permit and fact sheet to NMFS and USFWS when it is publicly noticed. Any comments received from the agencies regarding endangered species will be considered prior to issuance of the permit.

5.0 ANTIBACKSLIDING

18 AAC 83.480 requires that “interim effluent limitations, standards, or conditions must be at least as stringent as the final effluent limitations, standards, or conditions in the previous permit, unless the circumstances on which the previous permit was based have materially and substantially changed since the permit was issued, and the change in circumstances would cause for permit modification or revocation and reissuance under 18 AAC 83.135.” 18 AAC 83.480(c) also states that a permit may not be reissued “to contain an effluent limitation that is less stringent than required by effluent guidelines in effect at the time the permit is renewed or reissued.”

Effluent limitations may be relaxed as allowed under 18 AAC 83.480, CWA §402(o) and CWA §303(d)(4). 18 AAC 83.480(b) allows relaxed limitations in renewed, reissued, or modified permits when there have been material and substantial alterations or additions to the permitted facility that justify the relaxation, or, if the Department determines that technical mistakes were made.

The effluent limitations in this permit reissuance are consistent with 18 AAC 83.480. Therefore, the permit effluent limitations, standards, and conditions in AK0021547 are as stringent as in the previously issued permit. Accordingly, no further backsliding analysis is required for this permit reissuance.

6.0 ANTIDEGRADATION

Section 303(d)(4) of the CWA states that, for water bodies where the water quality meets or exceeds the level necessary to support the waterbody's designated uses, WQBELs may be revised as long as the revision is consistent with the State's Antidegradation policy. The State's Antidegradation policy is found in the 18 AAC 70 Alaska Water Quality Standards regulations at 18 AAC 70.015. The Department's approach to implementing the Antidegradation policy is found in 18 AAC 70.016 *Antidegradation implementation methods for discharges authorized under the federal Clean Water Act*. Both the Antidegradation policy and the implementation methods are consistent with 40 CFR 131.12 and approved by EPA. This section analyzes and provides rationale for the Department's decisions in the permit issuance with respect to the Antidegradation policy and implementation methods.

Using the policy and corresponding implementation methods, the Department determines a Tier 1 or Tier 2 classification and protection level on a parameter-by-parameter basis. A Tier 3 protection level applies to a designated water. At this time, no Tier 3 waters have been designated in Alaska.

18 AAC 70.015(a)(1) states that the existing water uses and the level of water quality necessary to protect existing uses must be maintained and protected (Tier 1 protection level).

Orca Inlet is not listed as impaired (Category 4 or 5) in Alaska's 2018 Integrated Water Quality Monitoring and Assessment Report; therefore, this antidegradation analysis conservatively assumes that the Tier 2 protection level applies to all parameters, consistent with 18 AAC 70.016(c)(1).

18 AAC 70.015(a)(2) states that if the quality of water exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality must be maintained and protected, unless the Department authorizes a reduction in water quality (Tier 2 protection level).

The Department may allow a reduction of water quality only after the specific analysis and requirements under 18 AAC 70.016(b)(5)(A-C), 18 AAC 70.016(c)(7)(A-F), and 18 AAC 70.016(d) are met. The Department's findings are as follows:

18 AAC 70.016(b)(5)

(A) existing uses and the water quality necessary for protection of existing uses have been identified based on available evidence, including water quality and use related data, information submitted by the applicant, and water quality and use related data and information received during public comment;

(B) existing uses will be maintained and protected; and

(C) the discharge will not cause water quality to be lowered further where the department finds that the parameter already exceeds applicable criteria in 18 AAC 70.020(b), 18 AAC 70.030, or 18 AAC 70.236(b).

The water quality criteria, upon which the permit effluent limits are based, serve the specific purpose of protecting the existing and designated uses of the receiving water. 18 AAC 70.020 and 18 AAC 70.050 specify the protected water use classes for the State; therefore, the most stringent water quality criteria found in 18 AAC 70.020 and in the Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances (DEC 2008) apply and were evaluated. This will ensure existing uses and the water quality necessary for protection of existing uses of the receiving waterbody are fully maintained and protected.

The permit places limits and conditions on the discharge of pollutants. The limits and conditions are established after comparing TBELs and WQBELs and applying the more restrictive of these limits. The water quality criteria, upon which the permit effluent limits are based, serve the specific purpose of protecting the existing and designated uses of the receiving water. WQBELs are set equal to the most stringent water quality criteria available for any of the protected water use classes. This also ensures that the resulting water quality at and beyond the boundary of any authorized mixing zone will fully protect all existing and designated uses of the receiving waterbody as a whole.

Conventional pollutants of concern in domestic wastewater are BOD5, TSS, and pH. Additional domestic wastewater pollutants are temperature, DO, ammonia, FC bacteria. Other pollutants of concern in the City of Cordova WWTP effluent are TRC and Enterococci Bacteria. The permit includes numeric effluent limits or continued monitoring addressing each of these pollutants of concern. The permit requires facilities to implement an Operation and Maintenance (O&M) Plan to minimize the production of waste and the discharge of pollutants to waters of the U.S., to ensure that domestic wastewater facilities provide for the protection or attainment of existing and designated uses.

The Department concludes the terms and conditions of the permit will be adequate to fully protect and maintain the existing uses of the water and that the findings under 18 AAC 70.016(b)(5) are met.

18 AAC 70.016(c)

(c) Tier 2 analysis for the lowering or potential lowering of water quality not exceeding applicable criteria. Tier 2 applies when the water quality for a parameter in a water of the United States within this state does not exceed the applicable criteria under 18 AAC 70.020(b), 18 AAC 70.030, or 18 AAC 70.236(b) and receives the protection under 18 AAC 70.015(a)(2).

(3) the department will not conduct a Tier 2 antidegradation analysis for

(A) reissuance of a license or general or individual permit for a discharge that the applicant is not proposing to expand;

In 2017, DEC conservatively assumed that the discharge from the City of Cordova WWTP was a discharge to a Tier 2 waterbody and accordingly conducted a Tier 2 antidegradation analysis. DEC determined that the City of Cordova WWTP permit would meet the Antidegradation Policy and the Department's July 14, 2010, *Policy and Procedure Guidance for Interim Antidegradation Implementation Methods* requirements. The *Interim Guidance* has been superseded by the 18 AAC 70.016 regulations.

18 AAC 70.016(c)(2)(A) states that when evaluating development of a license or general or individual permit for a discharge, the department will conduct a Tier 2 antidegradation analysis for a proposed new or expanded discharge. 18 AAC 70.990(75) states that new or expanded with respect to discharges means discharges that are regulated for the first time or discharges that are expanded such that they could result in an increase in a permitted parameter load or concentration or other changes in discharge characteristics that could lower water quality or have other adverse environmental impacts. Discharge is further defined in 18 AAC 83.990(22) as a discharge of a pollutant.

All pollutants regulated under the permit were also regulated under the prior permit, therefore, not considered a new discharge. The discharge covered under AK0021547 is not expanded from the previous permit. There will not be an increase in a permitted parameter load, concentration, or other change in discharge characteristics that could lower water quality or have other adverse environmental impacts.

18 AAC 70.016(c)(3)(A) states that the Department will not conduct a Tier 2 antidegradation analysis for reissuance of a license or general or individual permit for a discharge that the applicant is not proposing to expand. Therefore, consistent with 18 AAC 70.016(c)(2)(A) and 18 AAC 70.16(c)(3)(A), DEC is not conducting a Tier 2 antidegradation analysis for this permit reissuance.

7.0 OTHER PERMIT CONDITIONS

7.1 Quality Assurance Project Plan

The permittee is required to develop procedures to ensure that the monitoring data submitted are accurate and to explain data anomalies if they occur. The permittee is required to update, implement and/or maintain the Quality Assurance Project Plan (QAPP). The QAPP shall consist of standard operating procedures the permittee must follow for collecting, handling, storing and shipping samples; laboratory analysis; precision and accuracy requirements; data reporting, including method detection/reporting limits; and quality assurance/quality control criteria. The permittee is required to amend the QAPP whenever any procedure addressed by the QAPP is modified. The plan shall be retained on site and made available to the Department upon request.

7.2 Operation and Maintenance Plan

The permit requires the permittee to properly operate and maintain all facilities and systems of treatment and control. Proper operation and maintenance is essential to meeting discharge limitations, monitoring requirements, and all other permit requirements at all times. The permittee is required to review and update the OMP that was required under the previous permit within 180 days of the effective date of the final permit to ensure that it includes appropriate best management practices and pollution prevention measures. The plan shall be retained on site and made available to the Department upon request.

7.3 Industrial User Survey

18 AAC 83.340 requires POTWs to identify and locate all Significant Industrial Users (SIUs) that discharge process wastewaters and associated pollutants to their wastewater treatment system. General and specific pretreatment prohibitions at 40 CFR 403.5, adopted by reference at 18 AAC 83.010(g)(2), contain prohibitions that apply to each industrial user introducing pollutants into a POTW, whether or not the industrial user is subject to other National Pretreatment Standards, or any national, State, or local Pretreatment Requirements. Therefore, in order to assess whether an industry or business has the potential to violate any general or specific pretreatment prohibition, and to determine if a pretreatment program should be developed and/or if pretreatment requirements should be included in the City of Cordova WWTP wastewater discharge permit, the permittee is required to submit with their permit reissuance application, Form 2A, a list of those industries or businesses that discharge and/or have the potential to discharge non-domestic wastewater to the WWTP's collection system. DEC may request further information on specific industries or business to assist in this evaluation.

7.4 Facility Plan

Section 3.4 of the permit requires the City of Cordova to develop a Facility Plan that evaluates the ongoing inflow and infiltration issues that cause the WWTP to receive high flows and necessitate bypasses of the treatment plant. The plan should evaluate sources of inflow and infiltration into the collection system, identify corrective actions or capital projects to address identified problems, and present a proposed timeline to complete corrective actions or capital projects. The plan is required to ensure that the permittee will be able to comply with all requirements, terms and conditions of this permit and 18 AAC 83.415.

A guidance manual for preparing a facility plan has been published by EPA (EPA-430/9-76-015 *Construction Grants Program Requirements*, 1975). Permittee may, at its discretion, follow procedures outlined in this publication.

7.5 Electronic Discharge Monitoring Report

The permittee must submit DMR data electronically through NetDMR per Phase I of the E-Reporting Rule (40 CFR 127) upon the effective date of the permit. Authorized persons may access permit information by logging into the NetDMR Portal (<https://cdxnodengn.epa.gov/occa-netdmr-web/action/login>). DMRs submitted in compliance with the E-Reporting Rule are not required to be submitted as described in permit APPENDIX A – Standard Conditions unless requested or approved by the Department. Any DMR data required by the Permit that cannot be reported in a NetDMR field (e.g. mixing zone receiving water data, etc.), shall be included as an attachment to the NetDMR submittal. DEC has established an e-Reporting Information website at <https://dec.alaska.gov/water/compliance/electronic-reporting-rule> that contains general information about this new reporting format.

Phase II of the E-Reporting rule will integrate electronic reporting for all other reports required by the Permit (e.g., Annual Reports and Certifications) and implementation is expected to occur during the term of the permit. Permittees should monitor DEC's E-Reporting Information website (<http://dec.alaska.gov/water/compliance/electronic-reporting-rule>) for updates on Phase II of the E-Reporting Rule and will be notified when they must begin submitting all other reports electronically. Until such time, other reports required by the Permit may be submitted in accordance with permit APPENDIX A – Standard Conditions.

7.6 Standard Conditions

APPENDIX A of the permit contains standard regulatory language that must be included in all APDES permits. These requirements are based on the regulations and cannot be challenged in the context of an individual APDES permit action. The standard regulatory language covers requirements such as monitoring, recording, reporting requirements, compliance responsibilities, and other general requirements.

8.0 OTHER LEGAL REQUIREMENTS

8.1 Ocean Discharge Criteria Evaluation

Section 403(a) of the CWA, Ocean Discharge Criteria, prohibits the issuance of a permit under Section 402 of the CWA for a discharge into the territorial sea, the water of the contiguous zone, or the oceans except in compliance with Section 403. Permits for discharges seaward of the baseline of the territorial seas must comply with the requirements of Section 403, which include development of an Ocean Discharge Criteria Evaluation (ODCE).

Interactive nautical charts depicting Alaska's baseline plus additional boundary lines are available at <https://www.charts.noaa.gov/ChartCatalog/Alaska.html> and interactive maps at https://alaskafisheries.noaa.gov/mapping/arcgis/rest/services/NOAA_Baseline/MapServer.

The charts and maps are provided for information purposes only. The U.S. Baseline committee makes the official determinations on baseline. Ocean Discharge Criteria are not applicable for marine discharges to areas located landward of the baseline of the territorial sea.

A review of the baseline line maps revealed that the City of Cordova WWTP Outfall 001A terminus is positioned landward of the baseline of the territorial sea; therefore, Section 403 of the CWA does not apply to the permit, and an ODCE analysis is not required to be completed for this permit reissuance. Further, the permit requires compliance with WQS such that 40 CFR 125.122(b) is met and therefore the discharge is presumed not to cause unreasonable degradation of the marine environment.

8.2 Endangered Species Act

The NMFS is responsible for administration of the Endangered Species Act (ESA) for listed cetaceans, seals, sea lions, sea turtles, anadromous fish, marine fish, marine plants, and corals. All other species (including polar bears, walrus, and sea otters) are administered by the USFWS.

The Endangered Species Act (ESA) requires federal agencies to consult with NMFS and the USFWS if their actions could beneficially or adversely affect any threatened or endangered species. As a state agency, DEC is not required to consult with these federal agencies regarding permitting actions; however, DEC voluntarily contacted the agencies to notify them of the proposed permit issuance and to obtain listings of threatened and endangered species near the discharge.

DEC contacted the USFWS and the NMFS on August 18, 2022, respectively, and requested them to identify any threatened or endangered species under their jurisdiction in the vicinity of the City of Cordova WWTP Outfall 001A. On August 24, 2022 DEC received a response from NMFS directing it to use the NMFS Endangered Species Act Critical Habitat Mapper on the NMFS website at <https://www.fisheries.noaa.gov/alaska/habitat-conservation/essential-fish-habitat-efh-alaska>.

The USFWS did not respond however, the Department accessed the USFWS website <https://ecos.fws.gov/ipac/location/index> on July 21, 2022. The website identified the endangered Short-tailed Albatross (*Phoebastria albatrus*) as possibly occurring at the location. The website identified habitat for the Northern Sea Otter (*Enhydra lutis kenyoni*) in the location of the Cordova WWTP's Outfall 001A which is protected under the Marine Mammal Protection Act.

The Department accessed the NMFS Endangered Species Act Critical Habitat Mapper on August 18, 2022. The mapping application identified critical habitat in the area of the discharge for the endangered Stellar Sea Lion (*Eumetopias jubatus*) and the Mexico Distinct Population Segment of humpback whale (*Megaptera novaeangliae*).

DEC will provide a copy of the permit and fact sheet to NMFS and USFWS when it is publicly noticed. Any comments received from the agencies regarding endangered species will be considered prior to issuance of the permit.

8.3 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (January 21, 1999) designates EFH in waters used by anadromous salmon and various life stages of marine fish under NMFS jurisdiction. EFH refers to those waters and associated river bottom substrates necessary for fish spawning, breeding, feeding, or growth to maturity including aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish. Spawning, breeding, feeding, or growth to maturity covers a species' full life cycle necessary for fish from commercially-fished species to spawn, breed, feed, or grow to maturity.

Section 305(b) of the Magnuson-Stevens Act 916 USC 1855(b)) requires federal agencies to consult NMFS when any activity proposed to be permitted, funded, or undertaken by a federal agency may have an adverse effect on designated EFH as defined by the Act. As a State agency, DEC is not required to consult with NMFS

regarding permitting actions, but voluntarily contacts NMFS to notify them of the proposed permit issuance and to obtain listings of EFH in the area.

DEC contacted NMFS on August 18, 2022 to provide them with early notification of DEC's intent to reissue AK0021547 and to provide them the opportunity to share concerns with DEC regarding EFH. On August 24, 2022 DEC received a response from NMFS directing it to use the NMFS Endangered Species Act Critical Habitat Mapper on the NMFS website at <https://www.fisheries.noaa.gov/alaska/habitat-conservation/essential-fish-habitat-efh-alaska>. DEC accessed the EFH mapper and found that Outfall 001 for the City of Cordova WWTP is in the area identified as EFH for Sockeye, Chinook, Chum, Coho, and Pink Salmon. The EFH mapper also listed: Dover, Rex, Flathead, Northern Rock, Southern Rock, and Yellowfin Sole; Walleye pollock, Arrowtooth Flounder; Pacific Cod; and Ocean Perch as having EFH in the area of the outfall.

This fact sheet and the permit will be submitted to the agencies for review during the public notice period and any comments received from these agencies will be considered prior to issuance of the permit.

8.4 Sludge (Biosolids) Requirements

Sludge means any solid, semi-solid, or liquid residue removed during the treatment of municipal wastewater or domestic sewage. State and federal requirements regulate the management and disposal of sewage sludge (biosolids). The permittee must consult both state and federal regulations to ensure proper management of the biosolids and compliance with applicable requirements.

A.3.4.1 State Requirements

The Department separates wastewater and biosolids permitting. The permittee should contact the Department's Solid Waste Program for information regarding state regulations for biosolids. The permittee can access the Department's [Solid Waste Program web page](#) for more information and who to contact.

A.3.4.1 Federal Requirements

EPA is the permitting authority for the federal sewage sludge regulations at 40 CFR Part 503. Biosolids management and disposal activities are subject to the federal requirements in Part 503. The Part 503 regulations are self-implementing, which means that a permittee must comply with the regulations even if no federal biosolids permit has been issued for the facility.

A POTW is required to apply for an EPA biosolids permit. The permittee should ensure that a biosolids permit application has been submitted to EPA. In addition, the permittee is required to submit a biosolids permit application to EPA for the use or disposal of sewage sludge at least 180 days before this APDES permit expires in accordance with 40 CFR §§ 122.21(c)(2) and 122.21(q) [see also 18 AAC 83.110(c) and 18 AAC 83.310, respectively]. The application form is NPDES Form 2S and can be found on EPA's website, www.epa.gov, under NPDES forms. A completed NPDES Form 2S should be submitted to:

U.S. Environmental Protection Agency
Region 10, NPDES Permits Unit OWW-130
Attention: Biosolids Contact
1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

The EPA Region 10 telephone number is 1-800-424-4372. Information about EPA's biosolids program and CWA Part 503 is available at www.epa.gov and either search for 'biosolids' or go to the EPA Region 10 website link and search for 'NPDES Permits'.

8.5 Permit Expiration

The permit will expire five years from the effective date of the permit.

9.0 References

Alaska Department of Environmental Conservation (ADEC), 2022. Integrated Water Quality Monitoring and Assessment Report. <https://dec.alaska.gov/water/water-quality/integrated-report/>. Approved September 15, 2022.

ADEC, 2018. 18 AAC 70 Water quality standards, as amended through March 5, 2020.

ADEC, 2014. Alaska Pollutant Discharge Elimination System Permits Reasonable Potential Analysis and Effluent Limits Development Guide.

ADEC, 2008. Alaska Water Quality Criteria Manual for Toxics and Other Deleterious Organic and Inorganic Substances, as amended through December 12, 2008.

Alaska Department of Fish and Game. 2020. Catalog of waters important for spawning, rearing, or migration of anadromous fishes-Southcentral Region, effective June 1, 2020.

Greg Balogh (greg.balogh@noaa.gov), "Re: T&ES and EFH Determination City of Cordova WWTP, Permit Reissuance –T & ES Determination," August 24, 2022.

Thorne, R.E., M.A. Bishop, R. E. Crawford, G. L. Thomas, S. M. Gay III, and K. George 2008. Impacts of seafood waste discharge in Orca Inlet, Prince William Sound. Exxon Valdez Oil Spill Gulf Ecosystem Monitoring and Research Project Final Report, (GEM Project 040725), Prince William Sound Science Center, Cordova, Alaska.

USEPA, "Technical Support Document for Water Quality-based Toxics Control," EPA/505/2-90-001, USEPA Office of Water, Washington, DC, March 1991.

USEPA, "Water Quality Standards Handbook: Second Edition," EPA-823-B-94-005a, USEPA, Washington, DC, August 1994.

USEPA, "Alaska DEC NPDES Permit Writer's Course" Reference Manual. May 2019.

APPENDIX A BASIS FOR EFFLUENT LIMITATIONS

A.1 Statutory and Regulatory Basis

18 AAC 70.010 prohibits conduct that causes or contributes to a violation of the WQS. 18 AAC 15.090 requires that permits include terms and conditions to ensure criteria are met, including operating, monitoring, and reporting requirements.

The regulations require the permitting authority to make this evaluation using procedures that account for existing controls on point and nonpoint sources of pollution, the variability of the pollutant in the effluent, species sensitivity (for toxicity), and where appropriate, dilution in the receiving waterbody. The limits must be stringent enough to ensure that water quality standards are met and must be consistent with any available wasteload allocation (WLA). The Clean Water Act (CWA) requires a Publicly Owned Treatment Works to meet effluent limits based on available wastewater treatment technology, specifically, secondary treatment effluent limit standards found at Title 40 Code of Federal Regulations (40 CFR) 133, adopted by reference in Alaska Administrative Code (AAC) 18 AAC 83.010(e). The Department may find, by analyzing the effect of an effluent discharge on the receiving waterbody, that secondary treatment effluent limits are not sufficiently stringent to meet Alaska WQS. In such cases, the Department is required to develop more stringent WQBELs, which are designed to ensure that the water quality standards of the receiving waterbody are met.

Secondary treatment effluent limits for POTWs do not limit every pollutant that may be present in the effluent. Limits have only been developed for five-day biochemical oxygen demand (BOD₅), total suspended solids (TSS), and pH. Effluent from a POTW may contain other pollutants, such as bacteria, ammonia, or metals, depending on the type of treatment system used and the quality of the influent to the POTW. When technology-based effluent limits (TBELs) do not exist for a particular pollutant expected to be present in the effluent, the Department must determine if the pollutant may cause or contribute to an exceedance of a water quality criteria for the waterbody. If a pollutant causes or contributes to an exceedance of a water quality criteria, a WQBEL for the pollutant must be established in the permit. Table A-2 summarizes the basis for effluent limits contained in the permit.

A.2 Secondary Treatment Effluent Limitations

The CWA requires a POTW to meet requirements based on available wastewater treatment technology. Section 301 of the CWA established a required performance level, referred to as “secondary treatment,” that all POTWs were required to meet by July 1, 1977. The secondary treatment standards in 40 CFR § 133.102, which the Department has adopted in 18 AAC 83.010(e), are TBELs that apply to all municipal wastewater treatment plants and identify the minimum level of effluent quality attainable by application of secondary treatment in terms of BOD₅, TSS, and pH. In addition to the federal secondary treatment regulations in 40 CFR Part 133, the State of Alaska requires daily maximum limitations of 60 milligrams per liter (mg/L) for BOD₅ and TSS in its own secondary treatment regulations [18 AAC 72.990(59)]. The secondary treatment effluent limits are listed in Table A-1.

Table A- 1: Secondary Treatment Effluent Limits

Parameter	Units	Average Monthly Limit	Average Weekly Limit	Maximum Daily Limit	Average Monthly Minimum Removal
BOD ₅	mg/L	30	45	60	85%
TSS	mg/L	30	45	60	
pH	s.u.	6.0 – 9.0 s.u. at all times			

A.3 Mass-Based Limitations

Alaska Pollutant Discharge Elimination Systems (APDES) regulations at 18 AAC 83.540 require that effluent limits be expressed in terms of mass unless they cannot appropriately be expressed by mass, if it is infeasible, or

if the limits can be expressed in terms of other units of measurement. In addition, 18 AAC 83.520 requires that effluent limits for a POTW be calculated based on the design flow of the facility in million gallons per day (mgd). The design flow of the City of Cordova Wastewater Treatment Plant is 0.7 mgd. The Department used the design flow to calculate loading limits in the permit for BOD₅, TSS, and ammonia. Expressing limitations in terms of concentration as well as mass encourages the proper operation of a facility at all times. The mass based limits are expressed in pounds per day (lbs/day) and are calculated as follows:

Mass based limit (lbs/day) = concentration limit (mg/L) × design flow (mgd) × 8.34

Where: 8.34 is a conversion factor with units (lbs x L) / (mg x gallon x 10⁶)

A.4 Water Quality – Based Effluent Limitations

WQBELs included in Alaska Pollutant Discharge Elimination System (APDES) permits are derived from water quality standards. APDES regulation 18 AAC 83.435(a)(2) requires that permits include WQBELs that can achieve water quality standards established under CWA Section 303, including state narrative criteria for water quality. The State's water quality standards are composed of use classifications, numeric and/or narrative water quality criteria, and an antidegradation policy. The use classification system identifies the designated uses that each waterbody is expected to achieve. The numeric and/or narrative water quality criteria are the criteria deemed necessary by the state to support the designated use classification of each waterbody.

Designated uses are those uses specified in water quality standards for each waterbody or segment whether or not they are being attained [40 CFR Section 131.3(f)]. Existing uses are those uses actually attained in a waterbody on or after November 28, 1975, whether or not they are included in the water quality standards [40 CFR Section 131.3]. Waterbodies in Alaska are designated for all uses unless the water has been reclassified under 18 AAC 70.230 as listed under 18 AAC 70.230(e). Some waterbodies in Alaska can also have site-specific water quality criteria per 18 AAC 70.235, such as those listed under 18 AAC 70.236(b).

The receiving waterbody for the discharge, Orca Inlet, has not been reclassified, nor have site-specific water quality criteria been established. Therefore, Orca Inlet must be protected for all marine water designated uses. The marine water designated uses are water supply for aquaculture, seafood processing and industrial; contact and secondary recreation; growth and propagation of fish, shellfish, other aquatic life, and wildlife; and harvesting for consumption of raw mollusks or other raw aquatic life.

A.4.1 Reasonable Potential Analysis

The Department used the process described in the Technical Support Document (TSD) for Water Quality-Based Toxics Control (Environmental Protection Agency, 1991) and DEC's guidance, APDES Permits Reasonable Potential Analysis and Effluent Limits Development Guide (June 30, 2014) to evaluate the City of Cordova Wastewater Treatment Plant (WWTP) effluent. Discharge monitoring reports (DMRs) from August 2017 to July 2022 and Form 2A Application to Discharge Effluent and Expanded Effluent Testing Data were reviewed to identify pollutants of concern. Pollutants of concern are those pollutants that already have a TBEL or WQBEL for a particular pollutant, pollutants with a total maximum load waste load allocation or watershed analysis, pollutants identified as present in the effluent through monitoring, or those pollutants that are likely to be present in the effluent based on the nature of the operation. The monitoring of the WWTP effluent as reported in the above documents, revealed the presence of ammonia, total residual chlorine, fecal coliform bacteria, enterococci, and temperature at levels above or with the possibility to exceed water quality criteria; therefore, these pollutants are pollutants of concern and were selected for further reasonable potential analysis.

When evaluating the effluent to determine if WQBELs based on chemical-specific numeric criteria are needed, the Department projects the receiving waterbody concentration for each pollutant of concern downstream of where the effluent enters the receiving waterbody. The chemical-specific concentration of the effluent and receiving waterbody and, if appropriate, the dilution available from the receiving waterbody, are factors used to project the receiving waterbody concentration. If the projected concentration of the receiving waterbody exceeds the numeric criterion for a limited parameter, then there is a reasonable potential that the discharge may

cause or contribute to an excursion above the applicable water quality standard, and a WQBEL must be developed.

According to 18 AAC 70.990(38), a mixing zone is an area in a waterbody surrounding, or downstream of, a discharge where the effluent plume is diluted by the receiving water within which specified water quality criteria may be exceeded. Water quality criteria and limits may be exceeded within a mixing zone. A mixing zone can be authorized only when adequate receiving waterbody flow exists, and the concentration of the pollutant of concern in the receiving waterbody is below the numeric criterion necessary to protect the designated uses of the waterbody.

A.4.2 Specific Water Quality-Based Effluent Limits

A.4.2.1 Dissolved Oxygen

Aerobic microorganisms require dissolved oxygen (DO) in order to metabolize organic wastes into inorganic byproducts and reproduce. Municipal wastewater exerts a demand on the oxygen resource of waterbodies via BOD₅. The water quality standards at 18 AAC 70.020(b)(15)(C) Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife are the most stringent and require that “Surface dissolved oxygen (DO) concentration in coastal water may not be less than 6.0 mg/l for a depth of one meter except when natural conditions cause this value to be depressed. DO may not be reduced below 4 mg/l at any point beneath the surface. DO concentrations in estuaries and tidal tributaries may not be less than 5.0 mg/l except where natural conditions cause this value to be depressed. In no case may DO levels exceed 17 mg/l. The concentration of total dissolved gas may not exceed 110% of saturation at any point of sample collection.”

DEC reviewed effluent data for the WWTP, from August 2017 – July 2022. DO daily minimum samples had concentrations ranging between 6.0 mg/L and 7.0 mg/L, averaging 6.16 mg/L. DO daily maximum samples had concentrations ranging between 6.8 mg/L and 14.0 mg/L, averaging 9.35 mg/L. Since all the samples met the most stringent Alaska WQS for DO at the end of the pipe, the Department has determined that the WWTP does not have a reasonable potential to exceed water quality criteria. As in the previous permit, DO is not included within the authorized mixing zone and end of pipe limits are carried forward.

A.4.2.2 Total Ammonia, as Nitrogen

Alaska WQS at 18 AAC 70.020(b)(23) states that the concentration of substances in water may not exceed the numeric criteria in the Alaska Water Quality Criteria Manual. Total ammonia is the sum of ionized (NH₄⁺) and un-ionized ammonia (NH₃). Temperature, pH, and salinity affect which form, NH₄⁺ or NH₃ is present. NH₃ is more toxic to aquatic organisms than NH₄⁺ and predominates with higher temperature and pH. Biological wastewater treatment processes reduce the amount of total nitrogen in domestic wastewater; however, without advanced treatment, wastewater effluent may still contain elevated levels of ammonia as nitrogen. Excess ammonia as nitrogen in the environment can lead to dissolved oxygen depletion, eutrophication, and toxicity to aquatic organisms.

DEC used the 85th percentile of the pH, temperature, and salinity receiving water data collected by the City of Cordova from Orca Inlet to establish an acute ammonia water quality criterion of 3.91 mg/L and a chronic ammonia water quality criterion of 0.59 mg/L. Effluent ammonia monitoring from August 2017 to July 2022 daily maximum results ranged from 0.0 mg/L to 12.7 mg/L.

Because the WWTP’s ammonia monitoring results indicated exceedances for both acute and chronic water quality criteria; ammonia was selected for RPA which demonstrated that there is reasonable potential for ammonia to exceed water quality criteria at the end of pipe. Since there is reasonable potential for ammonia to exceed water quality criteria at the end of the pipe, WQBELs were developed for ammonia (daily maximum 17 mg/L, average monthly 5.7 mg/L) that are protective of water quality criteria at the boundary of the mixing zone. See Fact Sheet APPENDIX B details on reasonable potential determination and APPENDIX C for details on permit limit derivation.

18 AAC 83.530(2) requires effluent limits from a continuously discharging POTW to be stated as average weekly and average monthly limits unless impracticable. Secondary treatment standards at 18 AAC 83.605 establishes average weekly limits (AWL) as being 1.5 times the average monthly limit (AML). Following this precedent, the AWL for TRC is derived by multiplying TRC's AML of 5.7 mg/L 1.5 times to obtain an AWL of 8.6 mg/L.

A.4.2.3 Total Residual Chlorine

Alaska WQS at 18 AAC 70.020(b)(23)(C) defines total residual chlorine concentrations for aquatic life for marine water, as the concentration of substances in water may not exceed the numeric criteria for aquatic life for marine water shown in the Alaska Water Quality Criteria Manual for Toxic and other Deleterious Organic and Inorganic Substances (Toxics Manual) which corresponds to a TRC chronic limit of 0.0075 mg/L, and the acute limit of 0.013 mg/L.

DEC reviewed the TRC monitoring data between August 2017 and July 2022. During this time period, the reported TRC value never exceeded the compliance concentration/minimum detection threshold level of 0.10 mg/L. However, during review of submitted monitoring data and subsequent follow-up with the City of Cordova it was determined by the city that the facility had been using an incorrect lab reagent for TRC testing. Since the laboratory procedure for TRC was uncertain for the permit period the data from the past permit period was not considered for RPA analysis.

It is expected by DEC that the City of Cordova WWTP, having the ability to dechlorinate, will be able to meet water quality criteria for TRC with dechlorination and adequate process control. Therefore, sampling frequency will be retained as a daily requirement with the standard DEC recognized compliance level of 0.10 mg/L. Since the compliance level achievable with for TRC exceeds water quality criteria there is reasonable potential for TRC to exceed water quality criteria at the end of the pipe. Therefore, TRC will be included in the authorized mixing zone driven by ammonia with water quality criteria met at the edge of the authorized mixing zone.

A.4.2.4 Temperature

Alaska WQS at 18 AAC 70.020(b)(22)(A)(ii) Water Supply: seafood processing states temperature may not exceed 15° C.

The Department reviewed effluent temperature results for the WWTP from August 2017 to July 2022 and found that effluent monitoring results demonstrate that the WWTP's effluent temperature had the potential to exceed the water quality standards for temperature. The effluent temperature ranged from a minimum of 3.2° C to a maximum of 18.9° C with an average temperature of 9.41° C with 1640 data points. Therefore, the effluent has reasonable potential to violate the temperature water quality criteria. The maximum expected temperature value is the same as the maximum observed temperature at 18.9° C. DEC modeled temperature as a heated discharge at the MEC in CORMIX and determined temperature requires a dilution factor of 2.4 to meet water quality criteria. Effluent temperature meets water quality criteria in 1.12 meters. Therefore, temperature water quality criteria will be met in the mixing zone sized for ammonia because of its greater dilution requirements (38.8).

DEC is including temperature within the authorized mixing zone. The permit requires the applicant to continue monitoring effluent temperature daily and in addition to reporting the monthly average effluent temperature the permittee must report the daily maximum observed temperature each month on the discharge monitoring report.

A.4.2.5 pH

Alaska WQS at 18 AAC 70.020(b)(18)(A)(i) (Water Supply – aquaculture) and 18 AAC 70.020(b)(18)(C) (Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife) states that the pH water quality criteria for marine water, “May not be less than 6.5 or greater than 8.5. Standard Units (SU), and may not vary more than 0.2 pH unit outside the naturally occurring range”.

DEC reviewed pH effluent monitoring results of the WWTP from August 2017 to July 2022. During this time period, the average minimum pH value observed was 6.53 SU and the average maximum pH value was 7.12

SU. The previous permit implemented QBELs for pH that required a minimum of 6.5 SU and a maximum of 8.5.SU, monitored at a daily frequency. This QBEL and monitoring frequency requirement is carried forward in this permit.

A.4.2.6 Fecal Coliform Bacteria

Alaska WQS at 18 AAC 70.020(b)(14)(D) states that the fecal coliform bacteria criteria for the harvesting for consumption of raw mollusks or other raw aquatic life the geometric mean of samples may not exceed 14 FC/100 mL, and not more than 10% of the samples may exceed a FC most probable number (MPN) of 43 FC/100 mL.

The DEC review of the WWTP effluent monitoring data for FC bacteria from August 2017 to July 2022. The previous permit limits were based on 18 AAC 72.990(21) which defines “disinfect” as “producing an effluent with the following characteristics: an arithmetic mean of the values...collected in 30 consecutive days that does not exceed 200 FC bacteria per 100 milliliters; and an arithmetic mean of the values for effluent samples collected in seven consecutive days that does not exceed 400 FC bacteria per 100 milliliters.” The result was limits for average month limit (AML) of 200 FC/100 mL, average weekly limit (AWL) of 400 FC/100 mL, and a DML of 800 FC/100mL. Effluent limits were not exceeded in the prior permit. However, results indicated that the WWTP cannot meet the Alaska WQS for FC at the end of the pipe through its disinfection methods. Sampling results from the past permit term ranged from 100 FC/100 mL to 800 FC/100 mL. All samples reported exceeded the Alaska water quality criteria of 14 FC/100 mL for Average Monthly Limit (AML) and the 43 FC/100 mL for DML. The average reported maximum daily concentration was 303 FC/100 mL. Therefore, a mixing zone for FC is required. At a maximum expected FC bacteria concentration of 800 FC/ 100 mL, FC bacteria requires a dilution factor of 18.6 to meet water quality criteria. Because ammonia requires more dilution (38.8) to meet water quality criteria FC bacteria is included in the authorized mixing zone sized for ammonia.

DEC multiplied the chronic mixing zone dilution factor by the FC bacteria water quality criteria and obtained an AML of 543 FC/100 mL and a DML of 1668 FC/100 mL. DEC then compared these limits with the previously authorized AML of 200 FC/100 mL, AWL of 400 FC/100 mL, and the DML of 800 FC/100 mL and selected the more stringent limits for the permit. The selected limits are protective of water quality criteria at the boundary of the mixing zone.

Therefore, based on the facility’s consistent ability to produce an effluent capable of meeting the FC bacteria concentration limits required of the vast majority of secondary treatment facilities throughout the state, and compliance with the State’s definition of disinfection at 18 AAC 72.990(21)(A)(B), the FC bacteria limits are carried forward from the previous permit. Monitoring of FC bacteria concentrations will be assessed for compliance with Alaska WQS at 18 AAC 70.020(b)(14)(D).

A.4.2.7 Enterococci Bacteria

Alaska WQS at 18 AAC 70.020(b)(14)(B) for contact recreation specifies that the enterococci bacteria concentration shall not exceed 35 enterococci cfu/100mL, and not more than an 10% of the samples may exceed a concentration of 130 enterococci cfu/100mL. Contact recreation is defined as activities in which there is direct and intimate contact with water. These activities typically only take place during the summer season, May to September.

DEC reviewed enterococci bacteria monitoring data from August 2017 to July 2022. During this period, the facility met the above stated enterococci bacteria water-quality criteria. Daily maximum results ranged from 1 colony forming unit per 100 milliliters (cfu/100 mL) to 31.8 cfu/100 mL. However, only fourteen data points were available from the previous permit period. Because of the limited data the permit retains the report only requirement for enterococci bacteria with the parameter being included in the regulatory mixing zone. Data from the permit period will be evaluated to determine if end of pipe limits are appropriate for the next reissuance.

A.4.2.8 Floating, Suspended or Submerged Matter, including Oil and Grease

Alaska WQS for floating, suspended or submerged matter, including oil and grease, are narrative. The most stringent standard, found at 18 AAC 70.020(b)(20)(D), requires that marine waters, “Residues are not allowed in surface waters of the state, in concentrations or amounts that have the following effects: may impair designated uses; cause nuisance or objectionable conditions; result in undesirable or nuisance species; or produce objectionable odor or taste”. Permit Section 1.2.3 contains language prohibiting the discharge of floating solids, visible foam, or oily wastes that produce a sheen on the surface of the receiving water.

A.5 Selection of Most Stringent Limitations

Table A-2 provides a summary and reference to those parameters that contain effluent limits at the point of discharge at the City of Cordova WWTP.

Table A- 2: Summary of Effluent Limitations

Parameter	Fact Sheet Reference	Type of Effluent Limit	Basis for Limit
BOD ₅	Fact Sheet Part 3.1 APPENDIX B- B.1	TBEL, implemented at end of pipe	18 AAC 83.010(e) 18 AAC 83.540
TSS			
pH	Fact Sheet Part 3.3 APPENDIX A- Part A.4.2.5	WQBEL, implemented at end of pipe	18 AAC 70.020(b)(18)
FC Bacteria	Fact Sheet Part 3.3 APPENDIX A- Part A.4.2.6	Dilution from mixing zone applied to meet WQS at boundary of mixing zone	18 AAC 70.020(b)(14)(D) 18 AAC 72.990(21)
Total Ammonia, as Nitrogen	Fact Sheet Part 3.3 APPENDIX A- Part A.4.2.2	Dilution from mixing zone applied to meet WQS at boundary of mixing zone	18 AAC 70.020(b)(23) 18 AAC 83.530(2)
Total Residual Chlorine	Fact Sheet Part 3.3 APPENDIX A- Part A.4.2.3	Dilution from mixing zone applied to meet WQS at boundary of mixing zone	18 AAC 70.020(b)(23)(C)
DO	Fact Sheet Part 3.3 APPENDIX A- Part A.4.2.1	WQBEL, implemented at end of pipe	18 AAC 70.020(b)(15)(C)

APPENDIX B REASONABLE POTENTIAL DETERMINATION

The following describes the process the Alaska Department of Environmental Conservation (the Department or DEC) used to determine if the discharge authorized in the draft permit has the reasonable potential to cause or contribute to a violation of Alaska WQS. The Department used the process described in the *Technical Support Document (TSD) for Water Quality-Based Toxics Control* (Environmental Protection Agency, 1991) and DEC's guidance, *Alaska Pollutant Discharge Elimination System (APDES) Permits Reasonable Potential Analysis and Effluent Limits Development Guide* (June 30, 2014) to determine the RP for any pollutant to exceed a numeric water quality criterion.

To determine if there is RP for the discharge to cause or contribute to an exceedance of a water quality criteria for a given pollutant, the Department compares the maximum projected receiving waterbody concentration to the criteria for that pollutant. RP to exceed exists if the projected receiving waterbody concentration exceeds WQS numeric criteria, and a water quality-based effluent limit (WQBEL) must be included in the permit (18 AAC 83.435).

The ambient concentration in the mass balance equation is based on a reasonable worst-case estimate of the pollutant concentration upstream from the discharge. For criteria that are expressed as maxima, the 85th percentile of the ambient data is generally used as an estimate of the worst case. If ambient data is not available, DEC uses 15% of the most stringent given pollutant's criteria as a worst-case example. Ammonia is used as an example to demonstrate the reasonable potential determination process. This section discusses how the maximum projected receiving waterbody concentration is determined and presents the RP analysis done for all pollutants examined in Table A-1 and Table A-2.

B.1 Mass Balance

For a discharge to a flowing waterbody, the maximum projected receiving waterbody concentration is determined using a steady state model represented by the following mass balance equation:

$$C_d Q_d = C_e Q_e + C_u Q_u \quad (\text{Equation B-1})$$

Where,

C_d = Receiving waterbody concentration downstream of the effluent discharge

C_e = Maximum projected effluent concentration

C_u = Assumed receiving waterbody ambient concentration

Q_d = Receiving waterbody flow rate = $Q_e + Q_u$

Q_e = Effluent flow rate (set equal to the design flow of the wastewater treatment plant (WWTP))

Q_u = Receiving waterbody flow rate

When the mass balance equation is solved for C_d , it becomes:

$$C_d = \frac{C_e Q_e + C_u Q_u}{Q_e + Q_u} \quad (\text{Equation B-2})$$

The above form of the equation is based on the assumption that the discharge is rapidly and completely mixed with the receiving waterbody. If a mixing zone based on a percentage of the critical flow in the receiving waterbody is authorized based on the assumption of incomplete mixing with the receiving waterbody, the equation becomes:

$$C_d = \frac{C_e Q_e + C_u (Q_u \times MZ)}{Q_e + (Q_u \times MZ)} \quad (\text{Equation B-3})$$

Where, MZ = the fraction of the receiving waterbody flow available for dilution. Where mixing is rapid and complete, MZ is equal to 1 and equation B-2 is equal to equation B-3 (i.e., all of the critical low flow volume is

available for mixing). If a mixing zone is not authorized, dilution is not considered when projecting the receiving waterbody concentration, and

$$C_d = C_e \quad (\text{Equation B-4})$$

In other words, if a mixing zone is not authorized, the Department considers only the concentration of the pollutant in the effluent regardless of the upstream flow and concentration. If the concentration of the pollutant in the effluent is less than the Alaska WQS, the discharge cannot cause or contribute to a water quality violation for that pollutant. In this case, the mixing or dilution factor (% MZ) is equal to zero and the mass balance equation is simplified to $C_d = C_e$.

Equation B-2 can be simplified by introducing a dilution factor (D):

$$D = \frac{Q_e + Q_u}{Q_e} \quad (\text{Equation B-5})$$

After the D simplification, this becomes:

$$C_d = \frac{(C_e - C_u)}{D} + C_u \quad (\text{Equation B-6})$$

B.2 Maximum Projected Effluent Concentration

To calculate the maximum projected effluent concentration, the Department used the procedure described in Section 3.3 of the *TSD*, “*Determining the Need for Permit Limits with Effluent Monitoring Data*” and the process described in section 2.4 of DEC’s guidance, *APDES Permits Reasonable Potential Analysis and Effluent Limits Development Guide*. In this procedure, the 99th percentile of the effluent data is the maximum projected effluent concentration which is used in the calculation of the maximum projected receiving waterbody concentration.

Since there are a limited number of data points available, the 99th percentile is calculated by multiplying the maximum observed effluent concentration (MOC) by a reasonable potential multiplier (RPM). The RPM is the ratio of the 99th percentile concentration to the MOC and accounts for the statistical uncertainty in the effluent data. The RPM is calculated from the coefficient of variation (CV) of the data and the number of data points. The CV is defined as the ratio of the standard deviation of the data set to the mean. When fewer than 10 data points are available, the *TSD* and DEC’s *APDES Permits RPA and Effluent Limits Development Guide* recommends making the assumption that the CV is equal to 0.6. A CV value of 0.6 is a conservative estimate that assumes a relatively high variability. In the example of ammonia, the Department used ProUCL, a statistical software program, to determine a CV of 1.5735. ProUCL indicated that the data set followed a non-parametric statistical distribution. Therefore, the RPM equation in section 2.4.2.1 of the RPA Guide is used to determine the RPM for ammonia.

$$RPM = \frac{\mu_n + z_{99} \sigma}{\mu_n + p_n \sigma} \quad (\text{Equation B-7})$$

Where for ammonia,

z_{99} = the z – statistic at the 99th percentile = 2.326

μ_n = mean calculated by ProUCL = 2.049

σ = the standard deviation calculated by ProUCL = 3.224

p_n = the z – statistic at the 95th percent confidence level of $(1 - 0.95)^{\frac{1}{n}} = 0.81$

n = number of valid data samples = 53

$$\text{RPM} = 1.3 \text{ (rounded)}$$

The maximum expected concentration is determined by multiplying the MOC by the RPM:

$$\text{MEC} = (\text{RPM})(\text{MOC}) \quad (\text{Equation B-8})$$

$$\text{MOC} = 12.7 \text{ milligrams per liter (mg/L)}$$

In the case of ammonia,

$$\text{MEC} = (1.3) * (12.7) = 16.51 \text{ mg/L}^*$$

* The above MEC calculation is simplified for illustrative purposes. The MEC is calculated in the RPA tool with an RPM prior to rounding. The actual MEC as calculated in the Department's RPA tool is 16.64 mg/L.

Comparison with ammonia water quality criteria:

In order to determine if RP exists for this discharge to exceed water quality criteria, the highest projected concentration is compared with the most stringent water quality criteria.

$\text{MEC} = 16.64 \text{ mg/L} > 3.91 \text{ mg/L}$ (acute ammonia criterion) and 0.59 mg/L (chronic ammonia criterion). YES, there is RP for ammonia to violate water quality criteria

Since there is RP for the effluent to cause an exceedance of water quality criteria for protection of aquatic life, and because ammonia is the parameter requiring the most dilution of pollutants that demonstrate reasonable potential to exceed chronic water quality criteria, a WQBEL for ammonia is required. See APPENDIX C for that calculation.

Table B-1: Reasonable Potential Analysis Results and Determination

Parameter	Max Observed Effluent Conc. (MOC)	Number of Samples	Upstream Concentration (C_u)	CV	Reasonable Potential Multiplier (RPM)	Max Expected Effluent Conc. (MEC)	Water Quality Criteria	End of Pipe RP?	Boundary of Mixing Zone RP?
Ammonia (mg/L)	12.7	56	0.165	1.5722	1.3	16.64	0.59 (chronic)	Yes	No
							3.91 (acute)	Yes	No

APPENDIX C EFFLUENT LIMIT CALCULATION

If the Alaska Department of Environmental Conservation (the Department or DEC) does not authorize a mixing zone, Alaska water quality criteria are applied at the end of the pipe, and technology-based effluent limits (TBELs) are selected for those parameters that are solely technology based.

When DEC authorizes a mixing zone, parameters are identified in the mixing zone that will require dilution to meet water quality standards numeric criteria. If there are TBELs for an identified parameter in the mixing zone, TBELs apply at the end of the pipe, and WQS numeric criteria for that parameter, apply at the boundary of the mixing zone. If the reasonable potential analysis requires the development of water-quality based effluent limits for specific parameters in order to protect aquatic life at the boundary of the mixing zone, WQBELs are applied as end-of-pipe effluent limits. Those parameters that are not identified in the authorized mixing zone, must meet applicable Alaska water quality criteria at the end of pipe. In the absence of WQ criteria for a particular pollutant, such as for 5-day biochemical oxygen demand and total suspended solids, TBELs are applied as end-of pipe effluent limits.

In the case of the City of Cordova Wastewater Treatment Plant, ammonia demonstrated reasonable potential to exceed WQS at the end of pipe and required the most dilution to meet WQS numeric criteria at the boundary of the authorized chronic mixing zone. Therefore, the Department developed WQBELs for ammonia based on the chronic and acute mixing zone dilution available for ammonia.

C.1 Effluent Limit Calculation

Once the Department determines that the effluent has a reasonable potential to exceed an Alaska water quality criteria, a WQBEL for the pollutant is developed. The Department used the process described in the *Technical Support Document (TSD) for Water Quality-Based Toxics Control* (Environmental Protection Agency, 1991) and DEC's guidance, *Alaska Pollutant Discharge Elimination System (APDES) Permits Reasonable Potential Analysis (RPA) and Effluent Limits Development Guide* (June 30, 2014) to calculate WQBELs for ammonia. The first step in calculating WQBELs is the development of wasteload allocations for the pollutant.

C.2 Mixing Zone-based WLA

When the Department authorizes a mixing zone for the discharge, the WLA is calculated using the available dilution, background concentrations of the pollutant, and the Alaska water quality criteria. Acute and chronic aquatic life standards apply over different time frames and may have different mixing zones; therefore, it is not possible to compare the WLAs directly to determine which standard results in the most stringent limits. The acute criteria are applied as a one-hour average and may have a smaller mixing zone, while the chronic criteria are applied as a four-day average and may have a larger mixing zone. To allow for comparison, long-term average (LTA) loads are calculated from both the acute and chronic WLAs. The most stringent LTA is used to calculate the permit limits.

C.3 “End-of-Pipe” WLAs

In many cases, there is no dilution available, either because the receiving waterbody exceeds the criteria or because the Department does not authorize a mixing zone for a particular pollutant. When there is no dilution available, the criterion becomes the WLA. Establishing the criterion as the WLA ensures that the permittee's discharge does not contribute to an exceedance of the criterion. As with the mixing-zone based WLA, the acute and chronic criteria must be converted to LTAs and compared to determine which one is more stringent. The more stringent LTA is then used to develop permit limits.

C.4 Permit Limit Derivation

Once the appropriate LTA has been calculated, the Department applies the statistical approach described in Chapter 5 of the *TSD* to calculate the daily maximum limit (DML) and average monthly limit (AML). This

approach takes into account effluent variability (using the coefficient of variation (CV)), sampling frequency, and the difference in time frames between the Monthly Average and Daily Maximum effluent limits.

The Daily Maximum effluent limit (Daily Maximum) is based on the CV of the data and the probability basis, while the Monthly Average is dependent on these two variables and the monitoring frequency. As recommended in the TSD, the Department used a probability basis of 95% for the Monthly Average effluent limit (Monthly average) calculation and 99% for the Daily Maximum calculation.

The following is a summary of the steps to derive WQBELs from WQS numeric criteria for pollutants that have RP to exceed Alaska water quality criteria. These steps are found in the Department's *Reasonable Potential Analysis (RPA) and Effluent Limitation Guidance* and the guidance's accompanying Microsoft Excel RPA Tool. The guidance and tool were used to calculate the Daily Maximum and Monthly Average for ammonia at in the City of Cordova WWTP permit.

Step 1- Determine the WLA

The acute and chronic aquatic life criteria are converted to acute and chronic waste load allocations using the following equations:

$$WLA_{a,c,hh} = (WQC_{a,c,hh})(D_{a,c,hh}) + C_s(1 - D_{a,c,hh})$$

$$WLA_{a,c,hh} = WQC_{a,c,hh} \left(\frac{Q_d + Q_s}{Q_d} \right) + C_s \left(1 - \left[\frac{Q_d + Q_s}{Q_d} \right] \right)$$

Where: $D_{a,c} = \text{Dilution} = \frac{(Q_d + Q_s)}{Q_d}$

$$D_{hh}(\text{Dilution [Human Health]}) = D_c(\text{Dilution[Chronic Aquatic Life]})$$

$$Q_s = \text{Critical Upstream Flow}$$

$$Q_d = \text{Critical Discharge Flow}$$

$$C_s = \text{Critical Upstream Concentration}$$

$$WLA_{a,c,hh} = \text{Wasteload Allocation (acute, chronic, or human health)}$$

$$WQC_{a,c,hh} = C_r = \text{Water Quality Criterion (acute, chronic, or human health)}$$

For ammonia:

$$D_a = 4.4$$

$$D_c = 38.8$$

$$C_s = 0.165 \text{ mg/L}$$

$$WLA_a = 16.643 \text{ mg/L}$$

$$WQC_a = 3.91 \text{ mg/L}$$

$$WLA_c = 16.655 \text{ mg/L}$$

$$WQC_c = 0.59 \text{ mg/L}$$

Step 2 - Determine the Long-Term Average (LTA)

The WLAs are converted to LTAs using multipliers that are derived from equations in section 5.4 of the TSD:

$$LTA_a = WLA_a * \exp(0.5\sigma^2 - z_{99}\sigma)$$

$$LTA_c = WLA_c * \exp(0.5\sigma_4^2 - z_{99}\sigma_4)$$

Where:

$$z_{99} = \text{the } z - \text{statistic at the } 99^{th} \text{percentile} = 2.326$$

$$LTA_a \text{ only: } \sigma = \ln[CV^2 + 1]^{1/2}$$

$$LTA_a \text{ only: } \sigma^2 = \ln[CV^2 + 1]$$

$$LTA_c \text{ only: } \sigma_4 = \ln\left[\left(\frac{CV^2}{4}\right) + 1\right]^{1/2}$$

$$LTA_c \text{ only: } \sigma_4^2 = \ln\left[\left(\frac{CV^2}{4}\right) + 1\right]$$

$$CV = \text{coefficient of variation} = \frac{\text{standard deviation}}{\text{mean}}$$

$$LTA_{chronic} = WLA_{chronic} * e^{(0.5\sigma^2 - z\sigma)}$$

For ammonia:

$$CV = 1.5735$$

$$LTA_a = 2.313 \text{ mg/L}$$

$$LTA_c = 4.217 \text{ mg/L}$$

Step 3 - Most Limiting LTA

To protect a waterbody from both acute and chronic effects, the more limiting of the two LTAs is used to derive the effluent limits. In the case of ammonia, the LTA_a is more limiting.

Step 4 - Calculate the Permit Limits

The Daily Maximum and Monthly Average are calculated using the following equations that are found in table 5-2 of the TSD:

$$MDL_{aquatic \text{ life}} = LTA * \exp(z_{99}\sigma - 0.5\sigma^2)$$

Where:

$$z_{99} = \text{the } z - \text{statistic at the } 99^{th} \text{percentile} = 2.326$$

$$\sigma_n = \ln[CV^2 + 1]^{1/2}$$

$$\sigma_n^2 = \ln[CV^2 + 1]$$

$$CV = \text{coefficient of variation}$$

$$AML_{aquatic \text{ life}} = LTA * \exp(z_{95}\sigma_n - 0.5\sigma_n^2)$$

Where:

$$z_{95} = \text{the } z - \text{statistic at the } 95^{th} \text{percentile} = 1.645$$

$$\sigma_n = \ln \left[\left(\frac{CV^2}{n} \right) + 1 \right]^{1/2}$$

$$\sigma_n^2 = \ln \left[\left(\frac{CV^2}{n} \right) + 1 \right]$$

$$CV = \text{coefficient of variation} = \frac{\text{standard deviation}}{\text{mean}}$$

n = number of samples per month

For ammonia:

DML = 17.0 mg/L (rounded)

AML = 5.7 mg/L (rounded)

APPENDIX D MIXING ZONE ANALYSIS CHECKLIST

The purpose of the Mixing Zone Checklist is to guide the permit writer through the mixing zone regulatory requirements to determine if all the mixing zone criteria at 18 AAC 70.240 are satisfied, as well as provide justification to authorize a mixing zone in an Alaska Pollutant Discharge Elimination System permit. See Fact Sheet Section 4.5 for the City of Cordova Wastewater Treatment Plant mixing zone analysis.

Criteria	Description	Resources	Regulation
Size	Is the mixing zone as small as practicable? If yes, mixing zone may be approved as proposed or authorized with conditions.	Technical Support Document for Water Quality-Based Toxics Control DEC's Reasonable Potential Analysis Guidance Environmental Protection Agency's Permit Writers' Manual CORMIX	18 AAC 70.240(k)(3)
Technology	Were the most effective technological and economical methods used to disperse, treat, remove, and reduce pollutants? If yes, mixing zone may be approved as proposed or authorized with conditions.		18 AAC 70.240(c)(1)
Low Flow Design	For river, streams, and other flowing fresh waters. - Determine low flow calculations or documentation for the applicable parameters.		18 AAC 70.240(l)
Existing Use	Does the mixing zone... (1) maintain and protect designated and existing uses of the waterbody as a whole? If yes, mixing zone may be approved as proposed or authorized with conditions.		18 AAC 70.240(c)(2)
	(2) impair overall biological integrity of the waterbody? If yes, mixing zone may be approved as proposed or authorized with conditions.		18 AAC 70.240(c)(3)
	(3) create a public health hazard that would preclude or limit existing uses of the waterbody for water supply or contact recreation? If yes, mixing zone may be approved as proposed or authorized with conditions.		18 AAC 70.240(c)(4)(B)
	(4) preclude or limit established processing activities or established commercial, sport, personal use, or subsistence fish and shellfish harvesting?		18 AAC 70.240(c)(4)(C)

Criteria	Description	Resources	Regulation
	If yes, mixing zone may be approved as proposed or authorized with conditions.		
Human consumption	<p>Does the mixing zone...</p> <p>(1) produce objectionable color, taste, or odor in aquatic resources harvested for human consumption?</p> <p>If yes, mixing zone may not be approved.</p>		18 AAC 70.240(d)(6)
Spawning Areas	<p>Does the mixing zone...</p> <p>(1) discharge in a spawning area for anadromous fish or Arctic grayling, northern pike, rainbow trout, lake trout, brook trout, cutthroat trout, whitefish, sheefish, Arctic char (Dolly Varden), burbot, and landlocked coho, king, and sockeye salmon?</p> <p>If yes, mixing zone may not be approved.</p>		18 AAC 70.240(f)
Human Health	<p>Does the mixing zone...</p> <p>(1) contain bioaccumulating, bioconcentrating, or persistent chemicals above natural levels to significantly adverse levels?</p> <p>If yes, mixing zone may not be approved.</p>		18 AAC 70.240(d)(1)
	<p>(2) contain chemicals expected to present a unacceptable risk to human health from carcinogenic, mutagenic, teratogenic, or other effects as determined using risk assessment methods approved by the Department?</p> <p>If yes, mixing zone may not be approved.</p>		18 AAC 70.240(d)(2)
	<p>(3) occur in a location where the department determines that a public health hazard reasonably could be expected?</p> <p>If yes, mixing zone may be approved as proposed or authorized with conditions.</p>		18 AAC 70.240(k)(4)
Aquatic Life	<p>Does the mixing zone...</p> <p>(1) cause a toxic effect in the water column, sediments, or biota outside the boundaries of the mixing zone?</p> <p>If yes, mixing zone may be approved as proposed or authorized with conditions.</p>		18 AAC 70.240(c)(4)(A)

Criteria	Description	Resources	Regulation
	(2) result in a reduction in fish or shellfish population levels? If yes, mixing zone may be approved as proposed or authorized with conditions.		18 AAC 70.240(c)(4)(D)
	(3) result in permanent or irreparable displacement of indigenous organisms? If yes, mixing zone may be approved as proposed or authorized with conditions.		18 AAC 70.240(c)(4)(E)
	(4) form a barrier to migratory species or fish passage? If yes, mixing zone may be approved as proposed or authorized with conditions.		18 AAC 70.240(c)(4)(G)
	(5) result in undesirable or nuisance aquatic life? If yes, mixing zone may not be approved.		18 AAC 70.240(d)(5)
	(6) prevent lethality to passing organisms; or exceed acute aquatic life criteria at and beyond the boundaries of a smaller initial mixing zone surrounding the outfall, the size of which shall be determined using methods approved by the Department? If no, mixing zone may not be approved.		18 AAC 70.240(d)(7) 18 AAC 70.240(d)(8)
Endangered Species	Are there threatened or endangered species (T/E spp) at the location of the mixing zone? If yes, are there likely to be adverse effects to T/E spp based on comments received from the United States Fish and Wildlife Service or National Oceanic and Atmospheric Association. If yes, will conservation measures be included in the permit to avoid adverse effects? If yes, mixing zone may be approved as proposed or authorized with conditions.		18 AAC 70.240(c)(4)(F)